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# *Archives of* PHYSICAL MEDICINE *and* REHABILITATION

*Preliminary Program Issue*

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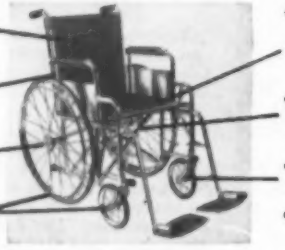

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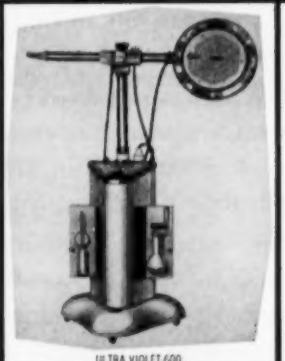

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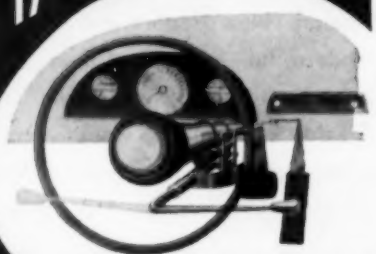

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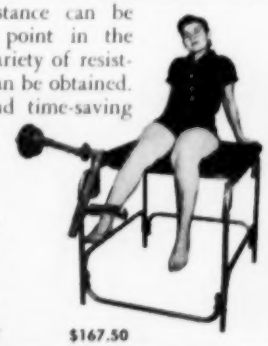

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# Effect of Body Position on Respiratory Muscle Function

Clarence W. Dail, M.D.
and
John E. Affeldt, M.D.
California

Functional rehabilitation requires that the patient assume an erect body position. In most cases, however, the patient spends several weeks or months in a lying position during the early phase of his disability. During this phase the patient's functional ability has to be first evaluated. Such early evaluation is especially necessary in those with respiratory muscle weakness for the patient's breathing ability may be considerably altered by change of body position.

The purpose of this paper is to discuss the practical aspects of the effect of changing the body to the erect position during the course of rehabilitation work. Our observations are on the basis of experience with over 1,000 patients with respiratory muscle weakness following poliomyelitis who have passed through this institution.

### Method of Study and Definition of Terms

In order to form a clear picture of the patient's respiratory function we have found it is necessary to study the breathing of normal individuals. The muscles that make up the total inspiratory and expiratory efforts will be analyzed in relation to normal breathing, as well as demonstrated by cases of isolated diaphragm, chest, neck accessory, and abdominal muscle movements. The effect of changing the body position to vertical will be described in the normal person as well as in poliomyelitis patients with various types of abnormalities.

Spirograms of normal subjects and of patients with different types of involvement were taken in the supine and erect body positions and will be used as an aid in demonstrating the concepts. These were made with a standard basal metabolism apparatus (Sanborn). By this method vital capacity and its components can be graphically demonstrated. A tilt table was used for placing the subject or patient erect.

When the subject is completely relaxed at the end of each expiration during quiet breathing ("tidal volume"), there is a certain volume of air in the lungs. This is called the "resting (end-expiratory) position." The maximal inspiration from this position is called the "inspiratory capacity;" the maximal expiration, the "expiratory reserve volume." These two values added together equal the "vital capacity."[1] The tracing in figure 1 illustrates the vital capacity and its components. The subject breathes quietly, relaxing completely at the end of each expiration. During the course of this quiet breathing he takes several maximal inspirations and expirations.

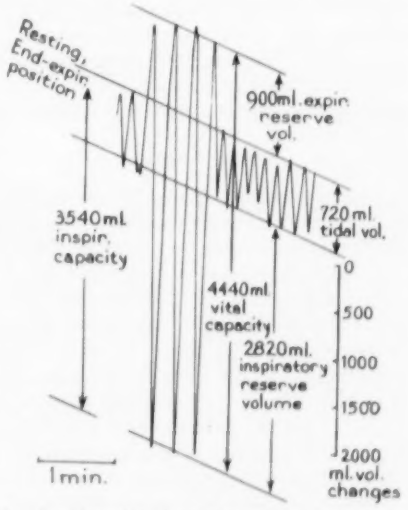


**Fig. 1 — Normal vital capacity and its components. The slant of the tracing indicates the rate of oxygen consumption as in the regular basal metabolism test.**

Read at the Thirty-fourth Annual Session of the American Congress of Physical Medicine and Rehabilitation, Atlantic City, N. J., September 13, 1956.

From the Respiratory Center for Poliomyelitis, Rancho Los Amigos Hospital, Hondo, and the Departments of Physical Medicine and Internal Medicine, College of Medical Evangelists, Los Angeles.

The Respiratory Center is aided by an annual grant from the National Foundation for Infantile Paralysis, Inc.

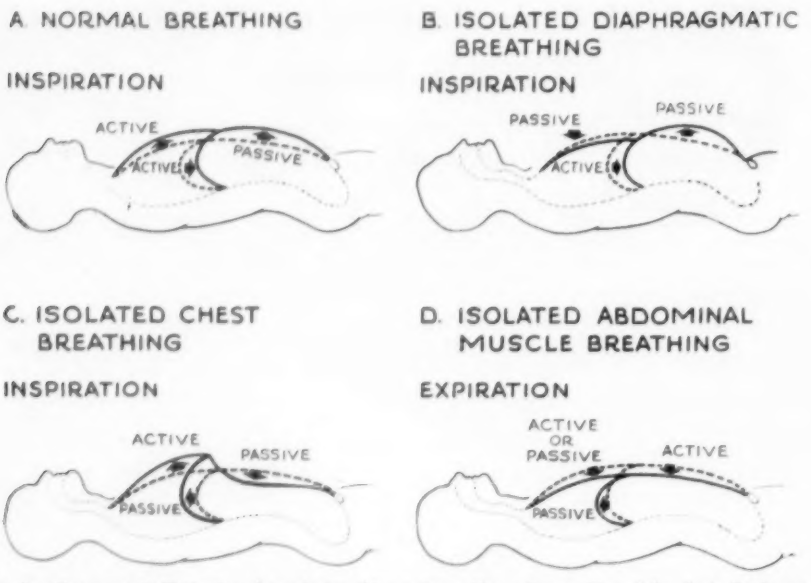


**Fig. 2 — Diagrammatic illustration of muscle breathing pattern. The resting position of the chest, diaphragm, and abdominal wall is illustrated by broken lines. The solid lines represent the position of these structures at the end of the action phase of breathing.**

Vital capacity figures obtained from patients with weak respiratory musculature can be expressed in terms of per cent of predicted normal values considering the patient's size, age and sex.[2]

### Supine Position

The movements made by a normal person as he breathes quietly in the supine position should be considered first. This might be considered the basic reference position, and it is in this position that the patients are usually seen first.

Normally, during quiet breathing in the supine position, there is expansion of the chest, which is due to contraction of muscles directly attached to the chest wall, and expansion of the abdomen, resulting from diaphragmatic contraction (fig. 2A). During inspiration, essentially no contraction of the neck accessory muscles occurs. During expiration, these movements gradually return to the original starting point as the inspiratory muscles relax — the resting (end-expiratory) position. Expiration is not associated with contraction of the expiratory muscles.

Deep breathing in the normal subject consists at first of expansion of the chest and abdomen, as previously described, but to a greater extent. During the latter portion of the inspiratory cycle, various accessory inspiratory muscles also contract, including the sternocleidomastoid muscle, the ribbon muscles, and the pectorales. Contraction of these muscles requires stabilization of their upper attachments, thus the trapezii, masseter, and temporalis muscles must also contract. Deep breathing is also associated with active expiration. This is associated with obvious abdominal muscle contraction, contraction of the latissimus dorsi, and sometimes the pectoralis major.

The inspiratory capacity is a volumetric expression of the force of all inspiratory muscles; the expiratory reserve volume, the force of all expiratory muscles (figs. 1 and 3).

The effect of body position on breathing is dependent on the specific distribution pattern of muscle weakness. In order to best demonstrate the action of the component muscle groups, we shall describe the breathing patterns produced by patients who have complete paralysis of all respiratory muscles except the diaphragm, the chest or neck accessory muscles, or the abdominal muscles.

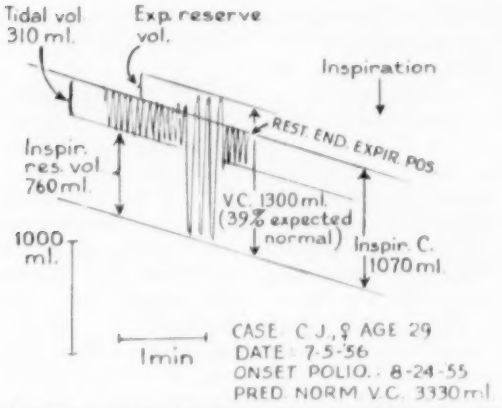


**Fig. 3 — Impaired vital capacity and its components. There is moderate weakness of all the muscles of breathing.**

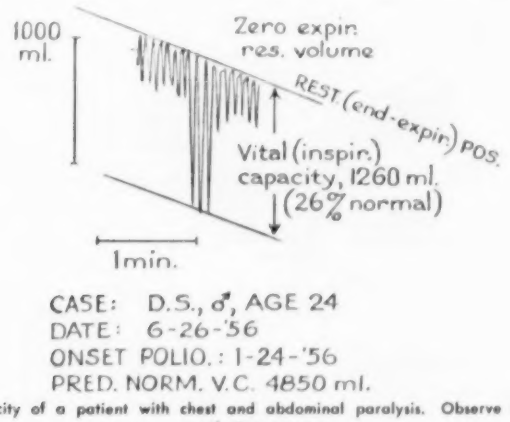


**Fig. 4 — Vital capacity of a patient with chest and abdominal paralysis. Observe the absence of any expiratory reserve.**

*Pure Diaphragm Breathing:* Pure diaphragm breathing is associated with abdominal expansion during inspiration as in the normal subject. Simultaneously, however, there is chest retraction instead of chest expansion. During expiration abdominal distention is gradually relaxed and chest retraction more suddenly returns to the original state. The resulting motion may be called paradoxical or reverse (fig. 2*B*).

A vital capacity tracing taken in such a case would be characterized by a low reading and there would be no expiratory reserve volume (fig. 4).

*Pure Chest Breathing:* Pure chest breathing produces greater expansion of the chest during inspiration than normal, and an associated passive abdominal retraction. Visualization of the diaphragm by fluoroscopic examination demonstrates that there is also an associated diaphragm elevation during inspiration. Because of the elevation of the diaphragm, the patient obviously is breathing at a disadvantage (fig. 2*C*). Expiration is a return to the starting point, and is a gradual relaxation of the chest muscles and a return of the abdominal retraction. Here again, there is reverse movement, or paradoxical breathing. The phasing of these movements, however, is opposite to that resulting from pure diaphragm breathing; during inspiration the chest expands rather than retracts, and the abdomen retracts rather than expands.

*Pure Neck Accessory Breathing:* When well developed, pure neck accessory

breathing is very obvious as these muscles stand out. The neck accessories lift the rib cage from the upper end of the sternum and cause the abdomen to be retracted as in pure chest breathing, but not as much.

*Pure Abdominal Muscle Breathing:* Pure abdominal muscle breathing produces a characteristic tracing (fig. 2*D*). During quiet breathing, the patient starts at the resting level and then, contracting the abdominal muscles, dips into the expiratory reserve volume. This is an *active* expiration. Inspiration is gradual relaxation of the expiratory effort. It is obvious that the resting position is the resting end-inspiratory position. In such a case, the resting lung position is best demonstrated with the help of a tank respirator (fig. 5).

### Effect of Changes in Body Position

When the body is perfectly relaxed and is passively moved from the supine to a vertical position, there will be an obvious drop of the abdominal wall. This, of course, will be associated with a corresponding drop of the abdominal contents and diaphragm. Naturally lung volume will increase and a certain amount of inspiration will result. The diagram in figure 6 demonstrates this change. If the lungs are connected to a spirometer during this process the change in the level of the resting position can easily be seen. This relationship is important in con-

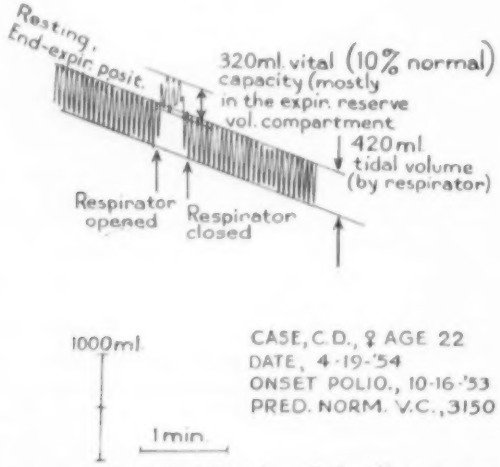


Fig. 5 — Vital capacity in a patient with abdominal muscle breathing. In a case such as this, the resting position is best demonstrated with the use of the respirator.

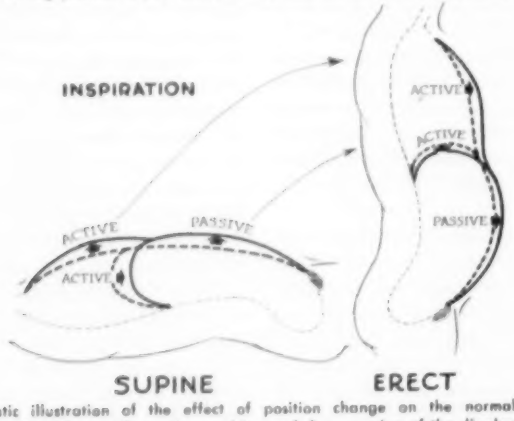


Fig. 6 — Diagrammatic illustration of the effect of position change on the normal breathing pattern. Note the effect on the resting position and the excursion of the diaphragm.

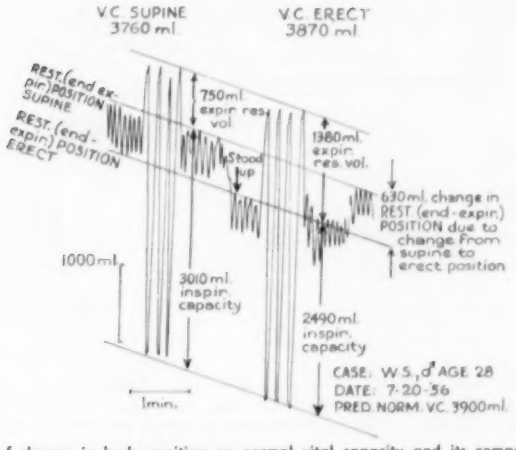


**Fig. 7 — The effect of change in body position on normal vital capacity and its components. Observe the relatively small change on the total vital capacity and the significantly great effect on the components and the resting position.**

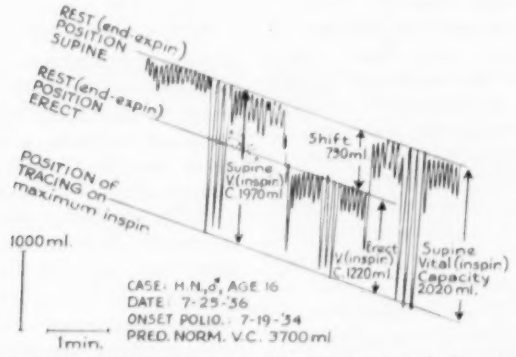


**Fig. 8 — Abdominal and chest muscle paralysis — the effect of change in body position on vital capacity and its components. Observe that with the absence of any expiratory reserve there can be no compensatory increase of this component when the erect position is assumed.**

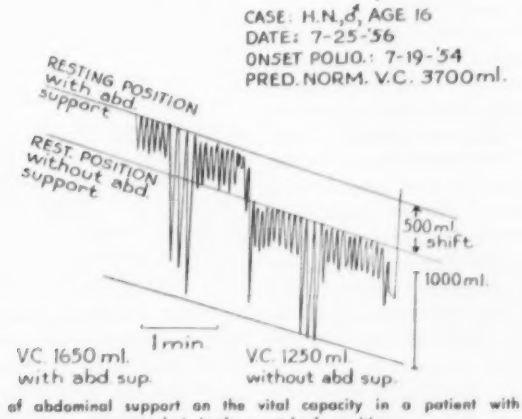


**Fig. 9 — The effect of abdominal support on the vital capacity in a patient with abdominal muscle paralysis in the erect body position.**

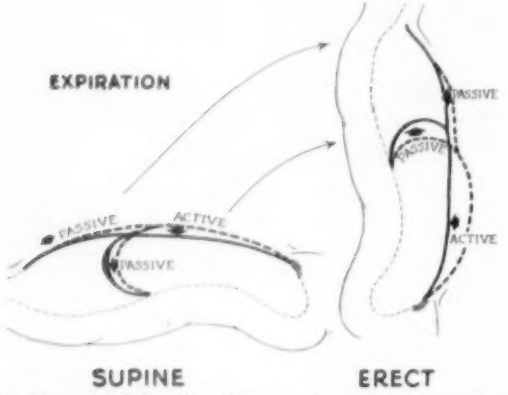


**Fig. 10 — Diagrammatic illustration of the effect of position change on a patient depending on abdominal muscle breathing. Note that the effect is opposite to that shown in figure 6.**

sidering any effect of change of body position on breathing.

When the body is erect, certain postural reflexes enter into the breathing pattern. These produce an increase in abdominal muscle tone. This, in part, compensates for the tendency of shifting of the resting end-expiratory position. In spite of postural tone, however, the normal vital capacity tracing shows a definite difference; when the subject stands, the expiratory reserve volume increases and the inspiratory capacity decreases (fig. 7). Observe that the total vital capacity changes only slightly. In the sitting position, especially when the arms are supported, there is less reflex tone than in the standing; therefore one would expect the differences to be greater.

*Pure Diaphragm Breathing:* Pure diaphragm breathing results in a marked shift of the resting position and a marked decrease of vital capacity when the erect position is assumed. This would be expected since diaphragm breathing is only in the inspiratory capacity compartment. If the diaphragm is strong, reserve is sufficient so that quiet breathing is not associated with any embarrassment; however, when appreciable weakness of the diaphragm is present, inefficiency of diaphragm function is sufficient to cause subjective dyspnea. Figure 8 illustrates a tracing from a patient who depends on the diaphragm — chest and abdominal muscle paralysis are present. As the patient is placed in a standing position, the respiratory rate increases, the tidal volume decreases, and the vital capacity is greatly decreased. Essentially no expiratory reserve volume is demonstrated in either position.

When a patient has marked abdominal weakness or paralysis associated with moderate diaphragm weakness, the embarrassed breathing while the patient is sitting may be lessened by the use of a properly fitting abdominal support. This partially neutralizes the downward pull of gravity and, as a consequence, the diaphragm can contract to better advantage. Figure 9 illustrates this effect.

*Pure Abdominal Muscle Breathing:* Pure abdominal muscle breathing is enhanced by the assumption of the erect body position since breathing is in the expiratory reserve compartment. This is in accord with figure 7, which shows that even in the normal subject there is an increase in the expiratory reserve volume in changing from the supine to the erect position. This relationship is demonstrated in figure 10. Figure 11 illustrates vital capacity measurements taken in both the lying and the erect positions in a patient who uses pure abdominal muscle breathing. Any abdominal restriction would make breathing more difficult in a case like this.

*Other Breathing Patterns:* When the patient breathes with either the chest or neck accessory muscles, changing the body position may either improve or impair breathing. The reason is not clear.

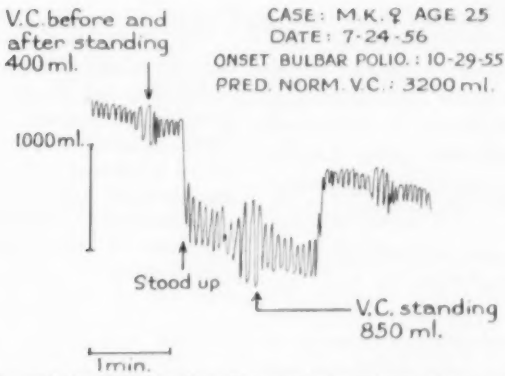


**Fig. 11 — Abdominal muscle breathing resulting from marked weakness of the diaphragm, chest, and neck accessory muscles. Observe the great advantage of the erect body position on breathing in this type of patient.**

Abdominal obesity may be a contributing factor.

Partial inclination produces an effect that is somewhere between that of the lying and the erect position. However, some patients breathe best in a partially inclined position, apparently due to their particular pattern of involvement.

Ordinarily we think of the paralyzed patient as lying supine, but this is frequently not the case. In fact, from a respiratory viewpoint, it may be desirable for the patient to lie on one side or the other. Usually this can be explained on the basis that one diaphragm is stronger than the other, and that the stronger diaphragm can work to better advantage when it is on the downward side and has the weight of abdominal viscera to work against. These relationships can be studied with horizontal fluoroscopy or double exposure roentgenograms.

## Discussion

From the viewpoint of the effect of gravity on breathing, there are essentially two types of patients. One type breathes best in the supine position, the other in the erect position. It is of considerable practical importance to recognize this. In the first type, activity requiring sitting and standing may have to be modified. In the second type, that is the patient who breathes with abdominal muscles, the assumption of the erect position will greatly facilitate breathing reserve. When a patient appears to be breathing with considerable difficulty in the lying position, and has not been tried sitting, one might naturally hesitate to proceed with an increased activity program. Since many patients are a mixture of the two types, it may make no difference in their breathing ability whether they are supine or erect.

In the presence of abdominal muscle paralysis and appreciable weakness of the diaphragm, it is usually beneficial to provide the patient with some type of abdominal support to aid his breathing in the erect position. The tightness of the support should be regulated to the weight of the abdomen and to the strength of the diaphragm. A certain amount of flexibility is usually desirable. Patients requiring this assistance are very prone to have marked trunk instability in addition to the breathing handicap; therefore, bracing may be indicated. Unfortunately, when bracing is sufficiently strong to maintain the trunk it may interfere with breathing, especially when the diaphragm is weak. The abdominal support has to be quite firm and rigid and the brace may have to be extended to include the ribs. Freedom of rib motion is especially needed when there is considerable dependence on chest and neck accessory breathing.

Early recognition of abdominal muscle breathing is important and diagnosis is easy. All one needs to do is to palpate the abdominal muscles, and at the same time notice the timing with inspiration

and expiration. The vital capacity tracing is also helpful in diagnosis. We have had patients unable to breathe at all unless they were in the erect position, so such patients should not be kept down in bed just because they cannot breathe. However, there should be a gradually increasing program of sitting tolerance.

Patients depending on abdominal muscle breathing are likely to have had poliomyelitis of the bulbar type and consequently need support for the head. If trunk fixation for head support is employed, the jacket or support must not curtail the movement of the abdomen and thereby limit the range of abdominal movement.


## Summary

The effect on breathing of change from the supine to the erect body position is described and the different patterns of paralysis are compared with the normal. These differences are demonstrated by means of diagrams of the muscle breathing patterns and vital capacity tracings. Practical implications are discussed, especially as they apply to physical rehabilitation.


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# Further Studies on the Treatment of Lymphedema

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Edema of the upper extremity after radical mastectomy is a disfiguring, distressing, and disabling condition. It probably occurs to some degree after 20 to 30 per cent of radical mastectomies, but is troublesome in only about 5 to 10 per cent.[1] The reason for its occurrence is not clear, but recent work suggests that it is primarily due to venous obstruction rather than to lymphatic obstruction.[2] Infection is probably not a factor in its initial development but may greatly aggravate an existing edema.

Foley[3] has found a conservative program, resembling the one recommended by us, usually successful. In patients resistant to his conservative program, he tried the Beck method of inserting celloidin strips to reestablish lymph circulation between the arm and chest wall, or the use of hyaluronidase injections. Neither of these procedures improved the edema any further. Guthrie[4] recommended the Beck procedure in those patients in whom there is minimal scarring. Schwartz[5] has successfully treated lymphedematous legs and arms with iontophoresis of hyaluronidase. Wakim, Martin, and Krusen[6] reported good results in treating edematous arms and legs using a pneumatic centripetal rhythmic compression device without other measures. This apparatus was used in the present studies, but other measures were added to the program.

Probably the best foundation for understanding the causes of edema and its rational management is the Starling[7] hypothesis. Promoting movement of water from capillary to tissue spaces are the hydrostatic pressure of the blood in the capillary and the osmotic pressure of protein in the tissue fluids. Promoting movement of water from the tissue spaces into the capillary are the hydrostatic pressure of the tissue fluids (the tissue turgor) and the osmotic pressure exerted by plasma proteins. Normally the net exchange of water is somewhat in favor of water leaving the capillary, and this extra water is removed from the tissue spaces by the lymphatic system.

The accumulation of water in the tissue spaces, which is edema, may be brought about by a variety of mechanisms, which operate through disturbing the balance of the pressures or obstructing the lymphatic flow. The hydrostatic pressure within the capillary may be increased by venous obstruction or by arteriolar dilatation. The tissue hydrostatic pressure may be reduced by stretching of tissues by previous swelling. The osmotic pressures may be affected by changes in capillary permeability, in which instance the plasma osmotic pressure, being greater than the tissue-fluid osmotic pressure, undergoes the greater reduction. An increase in tissue fluid protein or a decrease in plasma protein will also disturb their relationship in favor of formation of edema. If the part is in a dependent position, the flow of venous blood and of lymph will be resisted by the force of gravity.

The conservative management of lymphedema is based on attempts to increase venous and lymphatic drainage[8, 9] and to increase the tissue hydrostatic pressure. Movement of fluid out of the limb is aided by elevation, gentle kneading and friction massage in a centripetal direction, and isometric muscular contractions. It may also be aided by rhythmic centripetal compression of the extremity. Edema, however, will rapidly recur as soon as the limb is dependent again unless the hydrostatic pressure of

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the tissues is supported by elastic bandaging. If edema can be well controlled for several weeks, the tissues will regain their elasticity and a more normal size, and the tendency to edema formation will be reduced. When this stage is reached, if there is no persisting underlying cause for edema, it will not likely recur if elastic support is abandoned. However, in those patients in whom there is a persisting underlying cause for edema, such as lymphatic or venous obstruction, elastic support may be required at least part of the time that the patient is up and about.

Reduction of lymphedema of the upper extremity after mastectomy may require several weeks and may impose a considerable burden on the patient if it cannot be done as a home treatment. Home treatment is less likely to be neglected if the patient can perform it without the aid of other persons. For this reason we have been using a somewhat standardized program for home treatment, which most patients have been able to perform unaided and which, in most instances, has achieved some reduction of edema.

### Method of Treatment

For an initial period of from 2 days to a week or so the patient is treated twice daily in the section of physical medicine and rehabilitation. This treatment has usually consisted of use of mechanical intermittent centripetal compression with the "Vasopneumatic" device* for 30 minutes, followed by manual massage to reduce edema. The patient is taught to perform "muscle-setting" exercises of the forearm and arm. These portions of the treatment are done with the arm elevated on pillows or in a sling. The patient is instructed in bandaging the extremity from the dorsum of the hand up to about the area of the deltoid insertion, using two 3-inch elastic bandages stitched together end to end, employing a simple spiral bandaging technic.

Instructions are given to lie down with the arm elevated on pillows for ½ hour of each 2 hours during the day. During these periods of elevation, the bandage is left in place and the isometric exercises are performed a few times every 5 minutes. At the end of the period of elevation, before the patient gets up, she removes the bandage and reapplies it. This is important because the bandage works loose and becomes disarranged after it has been worn 2 or 3 hours. If it is not reapplied, it will give inadequate and uneven support. At night the bandage is left off, but the limb is kept elevated most or all of the night.

When the patient has learned to do the elevation, exercise, and bandaging well, she begins home treatment consisting of these procedures. Massage at home is neither encouraged nor discouraged, since it may be of some help but requires the aid of another person. After 2 weeks at home, the interval between periods of elevation and exercise and reapplication of the bandage is lengthened by an hour. If the edema continues to be well controlled after another week or two, the interval is lengthened by another hour, and finally the patient attends to these duties after lunch and dinner or at times convenient for her. At the end of 2 months the patient is instructed to experiment with leaving the bandage off for 2 hours before bedtime. The circumferences of the arm and forearm are measured when the bandage is removed and again at bedtime. If there has been no increase, the patient can leave the bandage off a little longer the next evening. In this way the patient can find out how long she can go without elastic support without the edema getting out of control. If it is apparent that elastic support is needed most of the time, an elastic sleeve may be more convenient to use than the bandage, but the sleeve should not be fitted while the edema is still decreasing. In some instances, occasional periods of elevation and exercise will be adequate to maintain improvement without continued use of elastic support.

### Methods of Evaluation of Edema

Measurement of the volume of the upper extremities was made by displacement of water in a large cylinder with

*Manufactured by the Poor & Logan Manufacturing Company, North Hollywood, Calif.

a side tube and graduated scale. This permits independent measurement of the hand, forearm, and arm, if desired, but the volume figures reported here are for the entire extremity up to about the level of the deltoid insertion. A record was kept in each case of the maximal depth of immersion above the ulnar styloid so that subsequent measurements would be comparable. When the extremity was too large to be inserted freely into the cylinder, another method was used in which water was displaced from a large rectangular container into a larger container in which the first was sitting. In addition to this, the circumferences of the extremities were measured with a flexible steel tape at the wrist, just below the elbow, just above the elbow, and at the level of maximal immersion near the deltoid insertion. Such measurements are reproducible within 5 mm. if care is taken to lay the tape on the skin without drawing it tight enough to indent the tissues.

Measurements were made in most instances before treatment was instituted, at the end of treatment in the section, and when the patient returned for recheck. Usually the control extremity was measured only once — at the first time of measurement of the involved extremity. Those patients who were not able to return for evaluation at the Mayo Clinic were asked to measure the circumference of the limb at the four sites listed to help give some idea of the change in limb size, if any. At this time no attempt has been made to evaluate these circumferential changes in terms of volume changes.

**Table 1: Data for Evaluation of Results of Home-Treatment Program**

| Case | Original Volume Difference between Right and Left Arm, Ml. | Days of Treatment in Section | Reduction in Volume in Section, Ml. | Weeks of Treatment at Home | Further Decrease in Volume at Home | Followed Home Instruction | Remarks |
|---|---|---|---|---|---|---|---|
| 1 | 2,455 | 4 | 810 | 17 | 800 ml. | Yes | |
| 2* | 910 | 3½ | 410 | 23 | 105 ml. | Yes | Had 2 sessions of treatment in section. |
| 3 | 1,030 | 2½ | 55 | 11 | 455 ml. | Yes | |
| 4 | 810 | 147 | 0± | — | 0± | No | Better in distal forearm. |
| 5 | 915 | 3½ | 180 | 25 | 0.5 to 3 cm.† | Yes | |
| 6 | 1,030 | 2½ | 475 | 13 | 145 ml. | Yes | |
| 7 | 1,135 | 2 | 345 | 22 | 1 to 2 cm.† | Yes | |
| 8* | 520 | 1½ | 65 | 22 | —1 to —2 cm.†‡ | No | |
| 9 | 555 | 3 | 45 | 19 | —190 ml.‡ | No | |
| 10 | 1,965 | 3½ | 650 | 19 | —1 to —3 cm.†‡ | Yes | |
| 11 | 1,220 | 2½ | 440 | 14 | 0.5 to 1 cm.† | No | Bandaged less than advised. |
| 12 | 525 | 6 | 25 | 14 | 100 ml. | Yes | |
| 13 | 1,010 | 1 | Not measured | 18 | —390 ml.‡ | No | |
| 14 | 250 | 3 | Not measured | 14 | 2 cm.† | Yes | No manual massage. |
| 15 | 790 | 3 | Not measured | 8 | 455 ml. | Yes | |
| 16 | 795 | 5 | 120 | 22 | 1 to 2 cm.† | Yes | |

* Patient received no "Vasopneumatic" therapy.
† Patient was followed up by questionnaire.
‡ Increase in volume.

## Results

Of 44 patients who have embarked on this treatment program since October, 1955, 16 have been followed long enough for evaluation of results of the home-treatment program. Of these, 9 were rechecked at the clinic and 7 answered a questionnaire. This asked for information on length and frequency of periods of elevation, length of time bandages were being worn, and whether swelling increased when bandages were left off. We also asked whether the patient felt that the program was worthwhile in reducing the size of the arm, making it more comfortable and making it more useful. Measurements of circumferences, as mentioned previously, were requested and, finally, any remarks the patient wished to add. Eight patients to whom the questionnaire was sent failed to reply, and two letters were unclaimed.

In table 1 the patients are arranged in the order in which they were started on the treatment program. In table 2 they are arranged according to whether or not they followed the home-treatment program. In table 3 only those patients who returned to the clinic for follow-up measurements are included. They are arranged in order of the size of the initial difference in volume between the two upper extremities. The case numbers are the same as in table 1.

**Table 2: Results According to Whether Patient Did or Did Not Follow Home-Treatment Program***

| | Followed Program | Followed Program only Partially |
|---|---|---|
| Decreased size of arm | | |
| Yes | 11 | 2 |
| No | 0 | 2 |
| Unknown | 0 | 1 |
| Decreased discomfort of arm | | |
| Yes | 9 | 2 |
| No | 0 | 3 |
| Unknown | 2 | 0 |
| Increased use of arm | | |
| Yes | 7 | 3 |
| No | 0 | 2 |
| Unknown | 4 | 0 |

* Two patients felt that the arm had decreased in size but measurements given on their questionnaires were 1 to 3 cm. larger than those taken when they left the clinic.

## Report of Cases

*Case 1:* Right radical mastectomy was performed in February, 1953. The patient noticed slight edema of the right upper extremity about 1 month later. On October 11, 1955, the volume of the right upper extremity measured 5,060 ml. and the left, 2,665 ml., a difference of 2,395 ml. Treatment was started twice daily with the "Vasopneumatic" device and manual massage only. On October 17, the right upper extremity measured 5,120 ml., although it was somewhat softer. At this time the muscle-setting exercises, elevation, and bandaging were added to the program. Four days later, on October 21, the volume of the right upper extremity was 4,310 ml., a decrease of 810 ml.

The patient followed the home-treatment program diligently until she returned on February 22, 1956, when the volume measured 3,510 ml., a further decrease of 800 ml. from the time she went home, or a total decrease of 1,610 ml. from the maximal measurement on October 17, 1955. She remained for treatment twice daily in the department with the

**Table 3: Results for Patients Who Returned for Follow-up**

| Case | Initial Limb Volume Difference, Ml. | Number of Treatments | Volume Reduction Obtained in Section, Ml. | Per Cent of Initial Difference | Total Reduction, Section and Home Treatment, Ml. | Per Cent of Initial Difference | Followed Home Treatment |
|---|---|---|---|---|---|---|---|
| 12 | 525 | 8 | 25 | 4.8 | 125 | 23.8 | Yes |
| 9 | 555 | 6 | 45 | 8.1 | —145* | —26.1 | No |
| 15 | 790 | 6 | ? | ? | 455 | 57.6 | Yes |
| 4 | 810 | 147 | 0± | 0± | 0 | 0 | No |
| 2 | 910 | 7 | 410 | 45.1 | 515 | 56.6 | Yes |
| 13 | 1,010 | 2 | ? | ? | —390* | —38.6 | No |
| 6 | 1,030 | 5 | 475 | 46.1 | 620 | 60.2 | Yes |
| 3 | 1,030 | 5 | 55 | 5.3 | 510 | 49.5 | Yes |
| 1 | 2,455 | 8 | 810 | 32.9 | 1,610 | 65.4 | Yes |

*Increase in volume.

"Vasopneumatic" device, manual massage, elevation, exercise, and bandaging. At the end of this time the volume of the right upper extremity was 3,260 ml., representing a further decrease of 250 ml., or a total of 1,860 ml. from the measurement of October 17, 1955.

In May, 1956, the patient was found to have a pleural effusion on a metastatic basis and has not been observed in our section since that time.

*Comment:* The difference in size of this patient's upper extremities was reduced from 2,455 ml. to 595 ml., with a great reduction in the discomfort and disability which accompanied the lymphedema. Of the 1,860 ml. reduction in volume, 800 ml. was accomplished on the home-treatment program over a period of 17 weeks. A further relatively rapid decrease of 250 ml. was obtained in 2 weeks of treatment in the clinic. This suggests that the treatment in the clinic is more efficacious, but considerable benefit can be derived from careful adherence to the home-treatment regimen.

*Case 2:* Right radical mastectomy was performed in May, 1955. In July, the patient had some infection in the axilla with cellulitis of the skin flap. This subsided after surgical drainage, but she noted some edema of the right upper extremity thereafter.

On November 9, 1955, the volume of the right upper extremity measured 3,135 ml. and the left, 2,225 ml., a difference of 910 ml. Treatment twice daily was started, consisting of elevation, manual massage, muscle-setting exercises, and bandaging, but not use of the "Vasopneumatic" device. On November 12, the right upper extremity measured 2,725 ml., a reduction of 410 ml. in 3½ days. She carried on with home treatment until April 24, 1956, at which time the right upper extremity measured 2,620 ml., representing a reduction of 105 ml. in 23 weeks at home. She was then treated twice daily as before, but with the addition of the "Vasopneumatic" device. On April 27, the right upper extremity measured 2,400 ml., a further reduction of 220 ml. in 3 days.

*Comment:* The difference in volume of this patient's upper extremities was reduced from 910 ml. to 175 ml. A considerable initial reduction in volume of 410 ml. in seven treatments was obtained without the help of the "Vasopneumatic" device. The reduction in volume on the home-treatment program was not large, but it was definite.

*Case 7:* The patient underwent left radical mastectomy on January 17, 1955. She had slight edema of the left upper extremity immediately postoperatively, but it did not get bad until December, 1955. She had considerable reaction to roentgen therapy noted in the skin in March, 1955. She was at the clinic in July, 1955, because of swelling in the left upper extremity. She continued with rest and elevation at home and came back on August 2, 1955, with the swelling much improved.

On February 9, 1956, the patient was referred to our section, at which time the right upper extremity measured 2,120 ml. and the left 3,255 ml., a difference of 1,135 ml. A program consisting of the "Vasopneumatic" device, manual massage, exercises, elevation, and bandaging was started. She also had contrast baths for the hands because they were bothering her a little with rheumatoid changes. After four treatments in the section, on February 11, the left upper extremity measured 2,910 ml., a decrease of 345 ml. in 48 hours.

A follow-up letter received July 19, 1956, reported that the patient elevates her arm somewhat at night. She stopped bandaging it after 4 months and found that it got no worse. She said that the treatment "did a great deal of good." Her range of motion was now as good as in the other arm. She had no more heavy feeling. She felt that it was definitely worthwhile in terms of reducing size and also in terms of decreasing discomfort and increasing use. The measurements that she reported showed no change at the wrist. There was a decrease of 1.3 cm. below the elbow, 1.3 cm. above the elbow, and 2.5 cm. below the shoulder.

*Comment:* This patient followed the home-treatment program as instructed and appears from her letter to have achieved a significant reduction in the size of the left upper extremity since she went home. After 4 months of controlling the edema she was able to abandon the elastic support without a recurrence of edema.

*Case 13:* The patient underwent left radical mastectomy on July 8, 1954. She noted a little edema shortly postoperatively, which became worse around September, 1955. The program for lymphedema was started on March 9, 1956, consisting of the "Vasopneumatic" device, manual massage, muscle-setting exercises, and bandaging. At this time the right upper extremity measured 2,650 ml. and the left, 3,660 ml., a difference of 1,010 ml. She was given two treatments and was not measured again prior to leaving. It was felt at that time that her program of orientation was too short. She returned on July 16, 1956, and reported that she had continued with the bandaging for a little while and then stopped. She had been elevating her arm at night and for a little while in the afternoon. Occasionally

during the day she would elevate it when convenient; however, she had not really followed the program.

About the middle of June, 1956, an infection had developed in the arm, which lasted for about 2 weeks and which responded to antibiotics. Measurement of the left upper extremity on July 16, 1956, some 2 weeks after the infection subsided, showed that the volume had increased 390 ml. to 4,050 ml. She was given nine treatments of "Vasopneumatic," manual massage, exercise, elevation, and bandaging, terminating on July 20, 1956, at which time the volume of the left upper extremity was 3,870 ml., a reduction of 180 ml. in 4 days. She seemed to have a better concept of what she was trying to do and was sent home for further home treatment.

*Comment:* This patient was unable to remain for an adequate period of treatment and instruction in March, 1956. She followed the home-treatment instructions very little and did not achieve much, if any, relief from the lymphedema. The condition was much aggravated by the development of cellulitis in the lymphedematous limb. This experience frightened her and on her return to the clinic in July, 1956, she was anxious to take any steps that might reduce the size of the limb.

### General Comment

Considerable relief of lymphedema following radical mastectomy can be obtained by relatively simple measures in a section of physical medicine and rehabilitation or at home. Two of the patients in this series did not have treatment with the "Vasopneumatic" machine (cases 2 and 8). One of these achieved a reduction of 410 ml. in seven treatments, diminishing the discrepancy between the upper extremities by 45 per cent. The other improved only by 65 ml. in three treatments, reducing the difference between the two extremities by 12.5 per cent. Similarly poor results were obtained, however, in several patients who underwent the mechanical centripetal compression (cases 3, 9, and 12). We feel that there are advantages to the use of the "Vasopneumatic" device. It frequently seems to provide a more rapid mobilization of edema fluid at the outset of the treatment program and is also helpful in keeping the patient coming to the department for a long enough time to permit adequate instruction in the remaining parts of the treatment which will be continued at home. A disadvantage of it is that some patients acquire an undue faith in the machine and believe that they cannot combat the edema without its help.

Co-operation of the patient in the treatment program is vital to its success, as observed by Bisgaard.[10] Table 2 demonstrates that the results were considerably better with those who adhered to the home-treatment recommendations than with those who did not.

Observations on patients obtained by questionnaire leave much to be desired; however, such observations are not entirely worthless, particularly regarding comfort and use of the arm. They have, therefore, been included in tables 1 and 2.

As a somewhat more objective evaluation, the questionnaire follow-up has been excluded from table 3, in which the patients are arranged in order of the initial discrepancy in limb size. It will be noted that it is a little easier to achieve a significant reduction in the lymphedema when the edematous limb measures in the order of 1,000 ml. larger than the control limb than when this difference is in the neighborhood of 500 ml. There is a sharp contrast in the effectiveness of the program when the three un-co-operative patients are compared with those who did follow the instructions.

Several patients who had not significantly reduced the size of the limb stated that they felt much more comfortable. The basis for this may be improved nutrition of the skin secondary to frequent mobilization of the edema fluid during the day. The edematous limb is usually observed to become softer before there is a notable reduction in size.

The hazard of cellulitis or lymphangitis occurring in the grossly edematous limb is real and ever-present. It may occur as often as every 3 months, causing a few days of confinement to bed and considerable discomfort and expense. It provides a clear indication for attempting to reduce the lymphedema. In our patients, when episodes of cellulitis occurred, the episodes as a rule were fol-

lowed by a considerable residual increase in the swelling and constitute one mechanism by which the lymphedema can be increased rapidly.

The likelihood that elastic supportive bandaging for the limb will be required permanently cannot be evaluated in advance. Of three patients reported here who are now maintaining their improvement without bandaging (cases 7, 8 and 12), the initial limb difference was about 500 ml. in two and 1,135 ml. in the third. They find that, with elevation during part of the night and occasionally during the day, the edema does not increase. The only satisfactory way to determine the need for continuing elastic support is to have the patient observe what happens when she goes without it for progressively longer periods at the end of the day. Bandaging may be required only during that part of the day when she is using the arm for the more strenuous types of housework. Such activities are generally seen to increase the swelling, probably because of increased blood flow into the extremity.

As yet we have not solved the problem of obtaining a suitable elastic sleeve to be used in place of the bandages. Modification of an elastic stocking to fit the arm has not been generally satisfactory. There are various sleeves on the market, but we have not yet had adequate opportunity to observe their value.

One patient, not included in the series reported here, obtained minimal benefit from elevation, exercise, and bandaging. She was given hyaluronidase by iontophoresis by her home physician and obtained a reduction of some 300 ml. of an edema measuring 1,620 ml. This she has been able to maintain fairly well with daily elastic support and occasional elevation and exercise. Episodes of cellulitis, which she formerly experienced about every 3 months, have ceased to occur except in minor degree. When she takes a long-acting penicillin preparation once a month she has no trouble with infections at all. She has not been included in the series of cases reported in this paper because early measurements were not adequate or well standardized. Her experience is mentioned to illustrate the problem of cellulitis and also the possible benefit to be obtained from hyaluronidase.

## Summary and Conclusions

Experiences with the management of lymphedema of the upper extremity developing after radical mastectomy in 16 patients are reviewed. The edema can generally be reduced by treatment in a section of physical medicine and rehabilitation. A home-treatment program that can be carried on by the patient without outside assistance is described. This was successful in producing and maintaining reduction of the edema in 11 patients who followed it closely and in 2 of 5 patients who followed it only partially.

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# Clinical Evaluation of Speech Deficiencies in Cerebral Palsy

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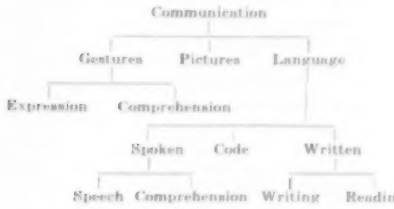
The ability to communicate, that is to receive and transmit thoughts, is one of the basic requisites of social integration. As indicated in the diagram, language is the highest form of communication, since it implies the use of symbols and deals with abstractions, whereas gestures and pictures are just representations. In this paper we will confine ourselves primarily with defects in transmission of thought by spoken language, although it is recognized that defects in written language are also often present and are closely related.




The language deficiencies, particularly speech deficiencies, that may be present in the child with cerebral palsy may be classified under two major categories, dependent on the presenting symptoms and causation. The patient may occasionally manifest mixed speech disorders falling into both categories. The first and largest category includes those in children who exhibit varying degrees of delay or retardation in language development. The second category includes those in children whose speech is approximately at the appropriate level of development, but with a distortion of its sound. This includes all defects of respiration, phonation, resonance, and articulation whether due to neuromuscular or structural disturbance. The former may be either organic or functional in nature.

## Speech Development

Children who develop communication along normal lines begin by babbling, which includes, first, the production of meaningless sounds, and later the production of sounds which may not convey meaning to others but appear with increasing consistency in response to external stimuli. The next stage of development is characterized by the use of single syllable and short multisyllabic words. From this level the child progresses to the use of short, then longer, phrases, and finally, sentences. The progression of the content of the child's speech begins with nouns, and is marked by the addition of verbs, adjectives, pronouns, conjunctions, articles, prepositions, and adverbs, generally in that order. Comprehension of speech at the various levels generally precedes the child's ability to communicate verbally at the same levels. Although the limits of what may be considered normal development may overlap over a large group of children, there will be no overlapping of levels of development within any one child. The chronology for these levels of language development may be summarized as follows:

| | |
|---|---|
| Babbling | 0-9 months |
| Words | 6-24 months |
| Phrases | 15-24 months |
| Sentences | 18-30 months |

At the time of evaluation, the child who exhibits a level of language development below that to be expected for his chronological age group may be considered to show delayed language development.

The child who demonstrates no language abilities at an age when he should be using sentences (3 years) is considered

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to show a "complete" delay in language development. A "severe" delay is considered to be one in which a child who should be speaking in sentences is at the single syllable word level. A "moderate" delay in language development is considered to be a delay of more than one level of development. A "mild" delay is considered to be a delay of one level (see table 1).

## Speech Production

The physical activity concerned with the production of speech has often been described as the most complex neuromuscular activity the human body is capable of performing.[1] Although in its actual operation the act of speaking is one continuous process, for purposes of description it may be broken down into its component phases: respiration, phonation, resonance, and articulation.

*Respiration for speech* is the active inhalation and exhalation of air in the lungs for the purpose of activating the vocal folds. *Phonation* is the act of producing a vocal tone or voice by forcing the air column from the lungs through the approximated vocal cords. *Resonance* is the amplification of the partial vibrations of the voice, in the mouth, pharynx, nasopharynx and nasal cavity, which determines the quality or timbre of the voice. *Articulation* is the act of modifying voice or breath stream by means of the mouth, lips, tongue, teeth, palate, uvula and nasal cavity to produce the sounds which comprise intelligible speech.

**Consonant Sounds.** The consonant sounds of English speech may be described generally by stating: (1) the articulatory structures involved in interrupting the breath stream (bilabial — both lips, labiodental — lower lip and upper teeth, linguadental — tip of tongue

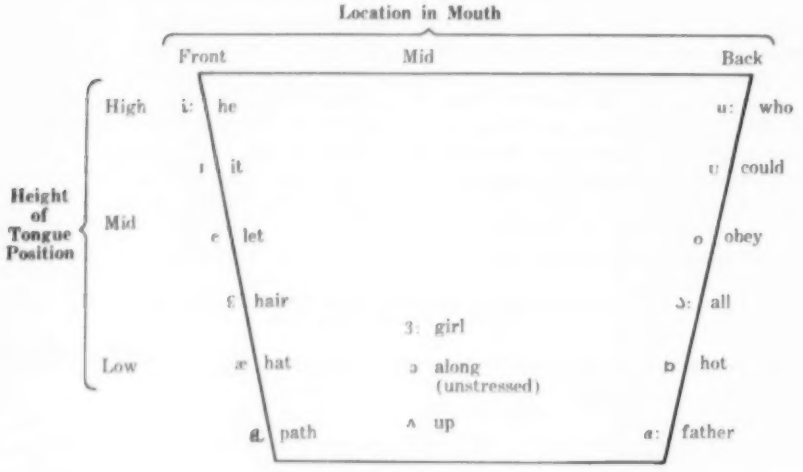
**Table 1: Incidence of Speech Deficiencies Among 192 Brain-Damaged Children Evaluated in a Cerebral Palsy Clinic**

| Speech Diagnosis | Complete | Severe | Moderate | Mild | Total Incidence | % of All Cases Seen |
|---|---|---|---|---|---|---|
| Delayed Language Development | | | | | | |
| Mentally retarded | 57 | 21 | 3 | 4 | 85 | 44.3 |
| Aphasiclike disturbance | 4 | 4 | | | 8 | 4.2 |
| Perceptual disturbance | 4 | 3 | 5 | | 12 | 6.2 |
| Emotional disturbance | 4 | 2 | 1 | 1 | 8 | 4.2 |
| Social retardation | 1 | 1 | 7 | 1 | 10 | 5.2 |
| Severe articulatory disorder | 9 | 2 | | | 11 | 5.7 |
| Deafness | 7 | | | | 7 | 3.6 |
| Total | 86 | 33 | 16 | 6 | 141 | 73.4 |
| Disorders of Speech Production | | | | | | |
| Articulatory disorders | | | | | | |
| Dysarthrias | 11 | | | | 11 | 5.7 |
| General | | 5 | 5 | 5 | 15 | 7.8 |
| Ataxic | | | 4 | 2 | 6 | 3.1 |
| | | | | (Total) | 32 | 16.7 |
| Dyslalias | | | | | | |
| Infantile | | 1 | 6 | 8 | 15 | 7.8 |
| General | | | 7 | 6 | 13 | 6.7 |
| Dysphonias | | | 1 | | 1 | 0.5 |
| Rhinolalia | | 1 | | 2 | 3 | 1.6 |
| Dysrhythmia | | | | 3 | 3 | 1.6 |
| Stuttering | | 1 | 1 | 1 | 3 | 1.6 |
| Malocclusion<br>Cleft palate<br>Dental protrusion | | | | 1 | 1 | 0.5 |
| Total | 11 | 8 | 24 | 28 | 71 | 37.0 |

**Table 2: English Consonant Sounds**

| | Plosive | | Fricative | | Continuant | | Glide | | Affricates | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Voiced | Voiceless | Voiced | Voiceless | Oral | Nasal | Voiced | Voiceless | Voiced | Voiceless |
| Bilabial | b | p | | | | m | w | wh | | |
| Labiodental | | | v | f | | | | | | |
| Linguodental | | | th | th | | | | | | |
| Linguo-alveolar | | | z, zh (3) | s, sh (ʃ) | r | n | y | | dzh | tch |
| Linguopalatal | g | k | | | | ng (ŋ) | | | | |

**Table 3: English Vowel Sounds**




inserted between the teeth, linguo-alveolar — tip of tongue elevated to alveolar ridge, and linguopalatal — back of tongue elevated to the posterior portion of the soft palate); (2) the degree of interference with the breath stream (plosive — in which the breath stream is completely stopped and suddenly released, fricative — in which the breath stream is impeded but not completely blocked, affricate — a combination of a plosive and a fricative, glide — which involves a movement of the lips or tongue during the production of the sound, and continuant — a voiced sound shaped, rather than obstructed, by the articulators); (3) the duration of the sound; and (4) whether the sound is voiced or voiceless. Sounds are also classified according to their position in a word, as initial, medial, or final. The sound represented by the symbol "p," for example, is generally classified as a voiceless bilabial stop-plosive. This description indicates that the breath stream is not accompanied by voice, that the sound is made by bringing the lips together, completely blocking the breath stream, and releasing it suddenly (see table 2).

**Vowel Sounds.** The vowel sounds are described by stating: (1) where in the mouth they are formed and (2) the tongue position for each sound. Thus the sound represented by the phonetic symbol "*a:*" (pronounced ah) would be classified at the lowest back vowel. The sound represented by the phonetic symbol "*i:*" (ee) would be classified as the highest front vowel (see table 3).

Speech production problems sufficient to prevent adequate communication have been classified as "severe"; those problems which make communication difficult but not unintelligible are classified as "moderate"; those problems which do not interfere with communication, but call attention to themselves, are classified as "mild."

### Clinical Evaluation

One hundred ninety-two consecutive referrals to the Cerebral Palsy Clinic of The Burke Foundation were given complete evaluations, including speech evaluations. Among these children the incidence of delayed language development was found to be 141 cases, or 73.4 per cent ranging from complete absence of speech at age seven to very slight delays in development. The incidence of abnormality of speech production was 71 cases or 40.6 per cent of our total number.

*Causes of Delayed Speech Development.* The following factors directly resulting from, or coexisting with, brain damage may impede normal development of language. They may be present in isolation or may be found in combination.

*Mental Retardation:* Delay of intellectual development will result in speech development commensurate with the child's mental, rather than chronological, age level (incidence of 85 cases, or 44.3 per cent).

*Aphasic or Aphasiclike Disturbances:* Organic damage to language areas of the brain will produce moderate to severe delays in development of communication, either expressive, receptive, or both (incidence of 8 cases, or 4.2 per cent).

*Disturbance of Perception:* Organic damage to the visual, auditory, and kinesthetic areas of the brain results in distortion of stimuli, produce distortion in concept formation, and result in delay or lack of language development (incidence of 12 cases, or 6.2 per cent).

*Severe Articulatory Disturbance:* Neuromuscular dysfunctioning is so severe in rare cases as to prevent completely the production of verbal expression (incidence of 11 cases, or 5.7 per cent).

*Emotional Disturbance:* Neuromuscular involvement of the child and feelings of guilt by the parents often lead to distortion of parental attitudes and child-rearing technics, varying from intense overprotection at one extreme to overt hostility and rejection at the other. As a result of these attitudes, many cerebral palsied children fail to mature emotionally, particularly in the area of interpersonal relationships. As a result, the child's desire and ability to communicate effectively are often adversely affected[2] (incidence of 8 cases, or 4.2 per cent).

*Social Retardation:* An important factor in the development of language is the ability of the child to experience contact with his environment and his peers. The child who, through limitations of a physical, psychological, or social nature, is prevented from experiencing this contact will be limited in social and communicative skills, attitudes, and concepts, and therefore will show retardation in language (incidence of 10 cases, or 5.2 per cent).

*Hearing Impairment:* One of the three primary receptive avenues through which children develop language skills is that of hearing. A child with a severe hearing impairment (greater than 30 decibels loss) or complete deafness, prior to the onset of language, will show little or no development in the area of language, although, with special technics, adequate speech can be developed. In our series there were 9 cases (4.5 per cent) of deafness, all classified as severe and of the nerve type. This incidence correlates fairly closely with Hopkin's figure of 5.3 per cent for children with defective hearing among the cerebral palsy population.[3] Delayed speech occurred in 7 of our patients with hearing defects, articulation disturbance was present in 2 patients and will occur in the other 7 as speech develops. Auditory perceptive difficulty was ruled out by the consistency of response to audiometric testing (incidence of 7 cases, or 3.6 per cent).

### Causes of Disorders of Speech Production

*Dysarthria:* The condition of defective articulation due to neuromuscular involvement of the lips, mandible, tongue and palate is called dysarthria. It is characterized by varying degrees of distortion and/or omission of consonant sounds, particularly in the medial and final positions. The movements of the tongue may be observed to be extremely limited, slow and sluggish, or incoordinated. There is usually a history of eating difficulty or delay in the develop-

ment of good eating habits. Drooling may be present (incidence of 26 cases, or 13.5 per cent).

*Ataxic Dysarthria:* Ataxic dysarthria is a form of dysarthria found frequently in ataxic children, and is characterized by inco-ordination, rather than loss of motor power, of the articulators. In addition, the flow of words is very slow and regular, lacking the variety of rhythm characteristic of normal speech patterns. Moreover, often the voice is weak in intensity and monotonous in pitch. The lack of variety in rhythm and pitch is generally due to lack of co-ordination of the muscles of respiration and the muscles of the larynx (incidence of 6 cases, or 3.1 per cent).

*Dyslalia:* The form of defective articulation known as dyslalia is due to factors other than organic. Among these factors are included emotional, sociological, imitative, mild hearing loss, or any combination of these. The term "defective articulation" is only applied when the distortion or omission of the sound or sounds persists beyond the chronological age at which normal production of the sound is to be expected. The sounds commonly distorted or omitted in this group of disorders include the sibilant (hissing) sounds, th, k, l, r, v, and t (incidence of 13 cases, or 6.7 per cent). Infantile perseveration is a particular type of dyslalia often found among children seriously retarded in emotional development. As a result of this immaturity the child's speech, which is a factor of his emotional development or lack of it, perseveres at the articulatory level of a much younger child. It is characterized by omissions, substitutions, and distortions of some initial and many medial and final consonants. The substitutions generally follow a typical pattern: f for th, w for l and r, and t for k; s and z are omitted in the medial and final positions and are substituted for by t or d in the initial position. Most often the child's other behavior and attitudes tend to be infantile as well (incidence of 15 cases, or 7.8 per cent).

*Dysphonia:* Dysphonia is a defect of phonation which results in abnormal vocal quality and may be due to neuromuscular, structural, habitual, or psychogenic dysfunctioning of the larynx. This condition is most frequently characterized in cerebral palsy by hoarseness, tenseness, breathiness, and lack of control of vocal pitch (incidence of 1 case, or 0.5 per cent).

*Resonance:* Hyperrhinolalia is nasal emission of other than nasal consonants or excessive nasal resonance and may be due either to the failure of the oronasal port to close (hyperrhinolalia aperta) or to a blockage of the anterior nasal cavity (as in rhinitis) which causes it to act as a cul de sac resonator (hyperrhinolalia clausa). Hyperrhinolalia aperta may be of two types: *passiva,* which is a failure of the nasal port to close because of weakness of the muscles involved, or *activa,* which is failure to close because of active spasm of the muscles which depress the soft palate and uvula. Hyperrhinolalia aperta may be distinguished more readily by having the child produce a prolonged vowel sound, such as "ee," while the examiner alternately pinches and releases the nostrils. A change in the nasal quality of the sound is an indication of hyperrhinolalia aperta.

*Hyporhinolalia,* or diminished nasal resonance, is seen when the nasopharynx is blocked as in enlarged adenoids and is not characteristic of cerebral palsy per se. In our series the only disturbance of resonance was hyperrhinolalia aperta passiva (incidence of 3 cases, or 1.6 per cent).

*Dysrhythmia:* Dysrhythmia is considered to be any deviation from the rhythm patterns characteristic of American speech. It includes deviations from normal patterns of stressed and weak syllables, lack of variety of stress, accent, and rate, and the extremes of slowness and rapidity of rate (incidence of 3 cases, or 1.6 per cent).

*Stuttering:* Stuttering has been defined as "a disorder characterized by irregular, unpredictable interruptions of the rhythmic patterns of speech; the spasms, tonic or clonic in form, may involve any part of the speech mechanism — breathing, phonation, resonance, and articulation — and often spread to auxiliary muscles."[4] (Incidence of 3 cases, or 1.6 per cent.)

*Structural Anomalies:* Among the structural anomalies, which are often considered as significant in the etiology of speech disorders, are included malocclusion, dental protusion, and cleft palate. In the 192 cases studied, although there was a high incidence of these anomalies, particularly of the malocclusion type, these did not appear to affect speech production significantly, expect for one case of repaired cleft palate.

### Analysis of Data

In this study 192 children ranging from 1 to 15 years of age (115 boys and 77 girls) were evaluated. The total group was composed of 94 (48.9 per cent) children with spasticity, 28 (14.6 per cent) with athetosis, 11 (5.2 per cent) with ataxia, 1 with tremor, 3 with atonia, and 55 (28.7 per cent) with minimal neuromuscular disability or undifferentiated. The latter group included children with brain injury resulting in minimal neurological findings or severe retardation of physical development who could not be placed in one of the classical categories. They may or may not have had evidence of mental retardation at the particular age of evaluation. They are typical of a group of patients who will be presented for diagnosis and evaluation in a cerebral palsy clinic. A definitive opinion may not be possible at first and clarification of the physical, mental, and speech problems must await developments over an extended period of observation.

Out of 192 cases, 162 children (84.4 per cent) had speech problems; 87.9 per cent of all boys and 79.3 per cent of all girls studied had speech problems. This correlates with the fact that speech problems of all kinds are more prevalent among males in the general population. In the "classical" cerebral palsy group, the incidence was 79 per cent.

Delayed language development alone occurred in 54 per cent of our total cases; faulty speech production, but on the appropriate language developmental level, occurred in 27 per cent; mixed developmental and production problems occurred in 3.4 per cent; and normal speech was present in 15.6 per cent.

Seventy-one (75.5 per cent) of the spastic children had speech problems; 47 (66.2 per cent) of these were pure language delay, 13 (18.3 per cent) were pure production problems, and 11 (15.5 per cent) were mixed type.

In 54 per cent of spastic patients with delayed speech development this difficulty was due to mental retardation; in 15.5 per cent, to severe neuromuscular involvement of the articulators as indicated by associated difficulty with mastication and deglutition; and in 3.5 per cent, to deafness without mental retardation.

In 29.4 per cent of spastic patients with speech production problems it was due to dysarthria, and in 50 per cent, to dyslalia.

Twenty-four (86 per cent) of the children with athetosis had speech problems; 18 (75 per cent) with speech problems had pure language delay, 4 (16.5 per cent) had pure production problems, and 2 (8.6 per cent) had mixed types.

In 55 per cent of the patients with athetosis, delayed speech development was due to mental retardation alone; in 10 per cent, to mental retardation and deafness; in 15 per cent to deafness alone; and in 11.1 per cent, to severe neuromuscular involvement of the articulators. In 25 per cent of the children with athetosis and with speech involvement, the problem was one of speech production rather than development.

Among the ataxic patients, 91 per cent had speech problems. Of these, 60 per cent showed typical ataxic dysarthria, and 30 per cent showed complete language delay due to mental retardation.

In the undifferentiated group, 98.3 per cent of the patients had speech problems. Of these, 77.8 per cent had pure language delay, 22.2 per cent had pure production disturbance, and a few had mixed types. It should be pointed out that a child with speech but at a delayed level is not considered to have a speech production problem (infantile dyslalia) when the articulation is commensurate with the level of language development regardless of the chronological age.

In the children with pure language delay, it was due to mental retardation alone in 57.5 per cent, to perceptual problems alone in 12.5 per cent, to emotional disturbance alone in 5 per cent, and to mixed causes in 25 per cent.

Among the patients with speech production problems, 75 per cent had dyslalia and 16.7 per cent had dysrhythmia.

It should be noted that perceptual difficulties were only considered the cause of delayed speech where they could be clearly differentiated from deafness, blindness, mental retardation, and aphasia. Delayed speech development occurred in 2 spastic and 2 athetoid patients purely on the basis of perceptual problems with good general intelligence, in 3 athetoid patients in whom perceptual problems could be definitely established despite some degree of mental retardation, and in 5 of the undifferentiated group on the basis of pure perceptual difficulty without mental retardation.

### Implications from Data

Tests of statistical significance, including critical ratio and standard error of measurement, have been performed for the foregoing data and indicate that the data concerning the group as a whole, the spastic group, and the undifferentiated group are significant, and while the small size of the athetoid group prevents any assumption of statistical significance, the authors' experience in cerebral palsy would tend to bear out the findings among this group as well.

The majority of children, regardless of sex, who are referred for a cerebral palsy evaluation will have a speech problem. Approximately one half of the children will have a delay in speech development; one quarter, adequate development but inadequate production; and a small proportion, a combination of both.

In almost one third of the total cases, mental retardation either alone or in combination is the cause of speech delay. Dysarthria is the largest single type of speech production problems (occurring in 45 per cent).

The relative frequency of speech problems is approximately equal in spastic (75.5 per cent) and athetoid children (86 per cent), and is increased in the undifferentiated group to 98.3 per cent.

Among typical spastic and athetoid patients there is little difference in incidence of speech problems as a whole or of the relative incidence of delay or production problems. The slightly higher relative incidence of the three classifications in the undifferentiated group may be explained, despite the slightly lower incidence of neuromuscular involvement, by the increased frequency of social and emotional factors. Since the incidence of mental retardation is not significantly greater, it supports our view that the minimally involved child with cerebral palsy is often subject to excessive psychological and social stress, which may manifest itself in speech disturbance.

In patients with speech problems, pure delayed speech development occurred in 66.2 per cent of the spastic, 75 per cent of the athetoid, and 77.8 per cent of the undifferentiated group. Pure speech production difficulties occurred in 18.3 per cent of the spastic, 16.5 per cent of the athetoid, and 22.2 per cent of the undifferentiated group.

The incidence of deafness among all cases seen was 9, or 4.7 per cent. Of these, 7 had complete delay and 2 had production problems. While the majority of such patients had athetosis, deafness can not lead one to assume athetosis, because one third of the cases occurred in spastic patients. At the same time, in an athetoid patient with delayed speech, deafness cannot be assumed since it only accounts for 25 per cent of all cases of delayed language development among children with athetosis.

The classification of complete delay in language development is used only for children over 3 years of age who have developed no meaningful speech. It is recognized that in time many of our patients so classified will develop speech on the sentence level and that this will show a variety of speech production difficulties.

Delay in speech development is usually complete or severe when seen in children under the age of 6 years. Evaluation of a group of cerebral palsied adults has borne out the expectation

that, as children grow, the incidence of delayed language development becomes rarer and less severe and the incidence of speech production problems becomes higher. The usual causes of complete or severe delay are mental retardation, aphasiclike disturbances, emotional disturbances, severe articulatory disturbances, and deafness. When the delay is mild, it is more likely due to social retardation or perceptual disturbance alone.

The most common cause of speech delay is mental retardation (44 per cent of all cases seen). Intensive specific speech therapy is limited in this group since intellectual development is an independent maturational phenomenon. Speech will eventually develop on a level consistent with the child's intellectual capacity. Structural defects were not found to be important as causes of delayed speech or faulty speech production despite the fact that they are commonly present. Speech production problems are most commonly mild or moderate in severity so that communication is possible although it may sound abnormal.

There were 28 cases of dyslalia and 8 cases of delayed language development due to emotional disturbance. Children with delayed speech due to emotional causes usually show severe emotional disturbances, minimal neuromuscular involvement, and may or may not be mentally retarded. Emotional disturbances causing speech production problems (dyslalias) tend to be less severe and more amenable to psychotherapeutic measures.

### Prognosis

The prognosis for the development of adequate speech on the three-year-old level, aside from content, is good when the delay in language development is due to mental retardation, aphasia, disturbances of perception, most cases of neuromuscular involvement, and deafness, assuming that the child develops intellectual and social abilities up to the three-year-old level and is receiving appropriate treatment.

The prognosis for the development of speech on the three-year old level is poor for those children who show indistinguishable combinations of severe emotional disturbance and mental retardation.

The prognosis for the improvement of speech production is in direct relationship to the severity of the problem, but in general is better in those with dyslalia, when the cause is determined and appropriate speech training and psychotherapeutic measures are instituted, than in dysarthria; it is better in cases of dysarthria than in dysrhythmia. In general, continued improvement can be expected under training and neuromuscular re-education, but the need for continuation of treatment may be determined by the total objectives for the patient.

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# New Apparatus: A Method for the Measurement of Minimal Muscle Force

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The recognition of the inadequacies of the Lovett system of manual muscle testing has prompted efforts to find a more exact technic.[1] The fact that this system continues to be the one generally employed although at times with modifications,[2, 3] indicates that the Lovett approach is still considered the most satisfactory. This popularity is due to its relative simplicity, rapidity of determination, applicability to most muscle groups, and absence of the need for any apparatus and for comparisons with any standards. Its major deficiency is a lack of exactness.

Obviously, it would be desirable to test muscles with absolute exactness and with observation of minute gradations. Such a refinement would be helpful in the making of a diagnosis and prognosis, in observing progress, in evaluating treatments, and in stimulating the patient. Unfortunately, the existence of many uncontrollable variables makes such absolute exactness an impossibility. These variables exist within the patient, in his environment, in the involved muscles, in adjacent structures, in the measuring instrument, and in the examiner. Many of these variables also affect the findings as made with the Lovett manual technic.[4-11]

As with any mechanical device, things can go wrong with the measuring instrument. The exactness with which it is used depends on the examiner. It is usually more time consuming than the purely manual approach. It involves additional costs. Its use may require comparison with standards which have not been established as yet. It may not be adaptable for the evaluation of all muscles. A review of the devices that have been employed for measurements of muscle power includes the spring scale,[1, 12-15] the tensiometer,[11] strain gage,[16, 17] ergograph,[18] electromyograph,[19] and the dynamometer.[20-24]

The ideal method for muscle evaluation should be clinically practical, simple, and rapid. The data obtained should be absolutely accurate so that the results can be reproduced by any examiner. No such ideal technic exists. With our rapidly advancing technological knowledge, we may come closer to this ideal. I am presenting a new measuring device with the idea that through its use some of the present day variables can be minimized.

## Description of Apparatus

The extremity to be tested is suspended from a metal bar which is rotatable freely in the horizontal plane through its ball-bearing attachment to a second bar. The latter bar is held securely to a rigid metal upright. The position of this second bar can be adjusted so that the vertical axis of joint rotation generally corresponds to that of the bar from which the limb is suspended. The unique advantage of this arrangement is that it permits movement with the influence of gravity removed to a high degree because rotation occurs above the region of the joint rather than above that corresponding to the center of weight, as in the usual method of suspension. This part of the apparatus has been described by Schenker.[25] Two additional bars have been added. One is held fixed in the same vertical plane as the freely movable one, and above it, by solid connections at both ends. A small upright projects above this upper bar. A stem threaded through this upright carries two small circular discs. The surfaces of these discs slant away from their centers. When in use, the projecting arm of a dynamometer is

Read at the Annual Meeting of the American Academy of Physical Medicine and Rehabilitation, Atlantic City, N. J., September 10, 1956.

Assistant Clinical Professor of Physical Medicine and Rehabilitation, Columbia University and Attending in Physical Medicine, Mt. Sinai Hospital, New York City; Attending in Physical Medicine and Rehabilitation, Franklin D. Roosevelt VA Hospital, Montrose, N. Y.

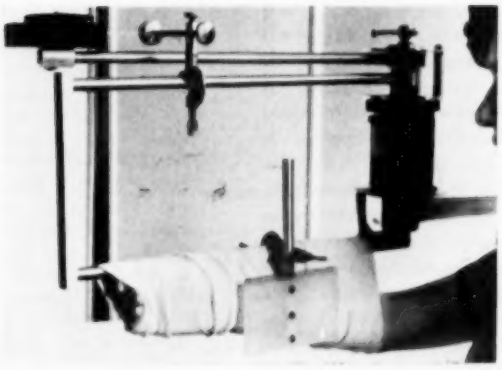

Fig. 1 — Testing flexors and extensors of forearm.

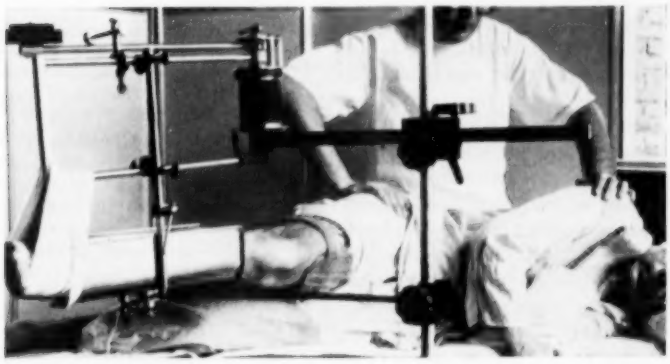

Fig. 2 — Testing flexors and extensors of knee.

held between the two discs or against the outer surface of the outermost disc. The dynamometer itself is rigidly secured by a thumb screw to another rod which can be easily positioned and then held fixed.

The dynamometers used in this study are made for industrial purposes. They are available in two sizes — the smaller one with a dial diameter of 1½ inches, and a larger one with a dial diameter of 2½ inches. The smaller instrument is made in five models, registering 2-15 gm. (3/32 to ½ oz.) to 15-150 gm. (½ to 5¼ oz.) full scale. The larger instrument registers 25-250 gm. (1 to 9 oz.) to 100-1,000 gm. (4 to 32 oz.) full scale. Of the two needles on the dial, one registers the pressure as it is applied, the other records the maximum value attained. The force to be measured is applied to the tip of the projecting arm. When registering full scale, these tips move through an angle of 15 degrees each way for the smaller instruments and through an angle each way of 20 degrees for the larger ones. These dynamometers appear to be both sensitive and accurate. The applied pressures could be measured by other types of dynamometers or by a strain gage.

### Technic of Use

The part to be tested is suspended from the movable portion of the apparatus by an attached metal trough or by a bandage. With the latter technic, a rigidly held paddle avoids the loss of energy transferance from the investigated muscles.

In use, attention is paid to several points of technic. Before determining the exerted force, the disc through which the pressure is applied is held against the tip of the dynamometer arm so that it makes contact, yet permits the dynamometer needle to remain at zero. The

necessary fine adjustment is accomplished by turning the threaded stem to which the pressure discs are attached. Substitution should be avoided as much as possible. This is accomplished by rigid cuffs and by manual restraint applied by the examiner. The distance from the point of rotation to the point where pressure is made against the tip of the dynamometer is measured and held constant when making subsequent determinations so as to avoid changes in leverage. Note is made of the angles between the extremity and the torso, and between the parts of the extremity, as between the forearm and arm, and between the leg and thigh, so as to duplicate these positions in subsequent examinations. A goniometer on the instrument helps in determining these angles. An additional variable which is largely obviated is the weight of the part moved, inasmuch as it is rendered comparatively weightless through this method of free motion. The determination is mainly of isometric, and to a lesser degree, of isotonic force at a given point on the arc of motion. When the apparatus is set up, the measurements can be made quickly. It has the disadvantage that its use is limited to the measurement of muscles producing motion at the larger joints.

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# The American Association of Electromyography and Electrodiagnosis

## FOURTH ANNUAL SCIENTIFIC SESSION

**Sunday, September 8, 1957 • Hotel Statler, Los Angeles**

At its fourth annual meeting, the Association will present the following papers: Regeneration of Abbe Flap by Lewis A. Leavitt; Electromyographic Activity in an Audio and Visual Demonstration by A. A. Marinacci; Electromyographic Observations in Extra-ocular Muscles by Max K. Newman; Electromyographic Consultations in a Private Office During a Recent Twelve Months Period by James G. Golseth; Electromyography Comes of Age by Cyril B. Courville; The Electromyogram and Motor System Disease by J. Sloan Berryman; Clinical Application of Measurements of Excitability and Conduction Velocity of Motor Nerves by Edward H. Lambert; Form of the Electromyographic Action Potential by Leonard W. Jarcho; Electromyographic Evidence of Role of Intercostal Muscles in Breathing by Gerald G. Hirschberg, and Electromyographic Study of the Hyperventilation Syndrome by Edwin M. Smith and George H. Koepke. A business meeting will follow the above presentations at 4:30 and at 6 P.M. will be the social hour and dinner.

Additional information can be obtained by writing the secretary, George H. Koepke, M.D., University Hospital, Ann Arbor, Michigan.

# Horizontal "Leg Press" Exercises

Roy H. Nyquist, M.D.
Charles E. Willhite, B.S.
Rudolph Jahn, B.S.
and
James P. Sheridan, B.S.
Long Beach, Calif.

This paper presents clinical observations which emphasize the importance of progressive resistive muscle group exercises[1-3] as an aid in improving the strength of weakened muscles in the lower extremities of patients with spinal cord injuries resulting in only partial paralysis of the lower extremities. These exercises can be performed on a new type of horizontal leg press apparatus with ease in comparison to the difficulty encountered in keeping the feet in the stirrups when exercising with the vertical leg press apparatus.[2]

Previously at this corrective therapy gymnasium "leg press" exercises had been given with a vertical leg press, with and without counterbalance.[2] The greatest difficulty encountered in using the vertical type apparatus was in keeping the feet in the stirrups. The method used in treating this latest group of patients was with the movable platform of an exercise table developed by Mr. M. S. McCarthy. By making a few positional adjustments of the supporting aluminum pipes and sockets, we were able to use the padded stirrups as assistive slings and supports as shown in the accompanying illustrations, thus leg press exercises were given in a horizontal supine position. The movable platform is pushed away from the foot of the apparatus for exercise against the resistance of springs. There are four springs on each side of the movable platform. These are special springs made of piano wire and are more resistant to breaking than the ordinary spring for exercise. The resistance of each spring is about 5 pounds at a 2 foot length and gradually increases up to about 20 pounds at a 6 foot length. Each one of these springs can be attached or detached from the movable platform and in this way the resistance is gradually increased or decreased as desired.

Fig. 1 — Bar with rubber tips holds the movable platform about 24 inches away from the end of an exercise table permitting greater ease to the patient to move from the wheelchair to the movable platform. Note position of feet against foot rest, use of assistive slings for supporting legs, pillow under back and buttocks, position of shoulders and neck against raised portion of platform, and position of head and hands. Note the eight springs between movable platform and end of exercise table.

Fig. 2 — The bar has been removed and the patient is extending the knees and hips against the resistance of the eight springs. Note the position of the hands.

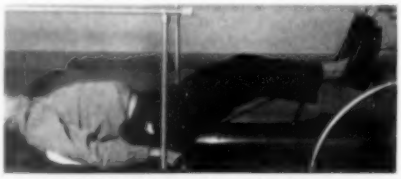

Fig. 3 — Note the hips and knees in almost complete extension.

Read at the Thirty-fourth Annual Session of the American Congress of Physical Medicine and Rehabilitation, Atlantic City, N. J., September 11, 1956.

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Supervisor, Corrective Therapy Clinic, Paraplegia Service, VA Hospital.

Assistant Chief, Corrective Therapy Section, Physical Medicine and Rehabilitation Service, VA Hospital.

Certified Corrective Therapist, Corrective Therapy Clinic, Paraplegia Service, VA Hospital.

Fig. 4 — Use of horizontal leg press exercise against resistance of three springs. Note remaining five springs fastened to movable platform and not in use at present. Assisting extension of knees with arms.

Fig. 5 — Use of leg press against resistance of eight springs possible in incomplete cervical injury without assistive slings to support the legs.

The results of treatment of five incomplete spinal cord injury patients by means of progressive resistive exercises for the lower extremities against the resistance of springs with the movable platform of the McCarthy exercise table have been favorable in regard to the muscles of the lower extremities being strengthened and ambulation being improved. The apparatus appears to have merit.

Acknowledgment: We wish to thank the Medical Illustration Service of the VA Hospital, Long Beach, Calif. for preparing the illustrations.

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## MAYO CLINIC PT SCHOOL ALUMNI ASSOCIATION

The Alumni Association of the Mayo Clinic School of Physical Therapy will hold its annual meeting in Rochester, Minnesota on August 23-24.

The following papers are scheduled for Friday: Evaluation of Hip Extension and Clinical Application by Martin O. Mundale; Assistive Devices by Leland Miller; Active Stretching Techniques by Harold Egli. On Saturday, a panel on ultrasound is scheduled with Gordon M. Martin, M.D., and staff therapists from the Section on Physical Medicine and Rehabilitation. Papers to be presented are: A Home Treatment Stimulator by G. Keith Stillwell; Dr. Stillwell will also present Physiological Basis for Neuromuscular Facilitation; Muscle Transplants by Paul Lipscomb and Earl C. Elkins.

A banquet will be held at 8 P.M. on Saturday and the guest speaker is H. Worley Kendell, Peoria, Ill.

# ocean – mountains – desert – metropolis hollywood glamour – subtropical climate all in one!

*Los Angeles County is an empire exceeding, in many respects some entire states.*

*Its spread and contrast are astounding: Pacific pleasure island, ocean beaches, one of the world's great harbors, picturesque deserts, three mountain ranges; factories and oil fields; lush valleys of orange groves and other produce make this one of the richest agricultural counties in the United States; the world's movie, radio and television capital; and a Spanish mission that predates the American Revolution.*

## Los Angeles Central Area

Los Angeles is the largest city in the U.S. in land size. You will be interested in:

**FREEWAYS.** Highspeed six- and eight-lane motorways cutting across town: Hollywood Freeway to Hollywood and San Fernando Valley; Pasadena Freeway to Pasadena; San Bernardino Freeway to east; Santa Ana Freeway to southeast.

**WILSHIRE BLVD.** "Fabulous Boulevard" of the best-selling book. Cafes and smart shops. Palms and banana trees sprouting from store patios.

**LA BREA TAR PITS.** Eons ago these black tar pools trapped hundreds of Saber-tooth Tigers, Mammoths, Imperial Elephants, other extinct beasts. Their bones were excavated to stock the world's museums. You see giant life-sized statues of the beasts.

**HOLLYWOOD.** Part of Los Angeles city.

**GRIFFITH PARK.** Largest city park in nation, 4227 mountainous acres. Deer graze in sight of City Hall. Zoo. Miniature railway. Transportation exhibit with old train. Greek Theater. Three public golf courses. Planetarium and observatory.

**EXPOSITION PARK.** 105,000-seat Memorial Coliseum, home field for the UCLA and USC football teams. Olympic Swim Stadium. Los Angeles County Museum, has the built-up skeletons of beasts from La Brea tar pits. California Museum of Science and Industry with exhibits of California mines, farms and industry. World's biggest rose garden, 15,000 bushes, 160 varieties, blooming most of year.

**SOUTHWEST MUSEUM.** One of the best Indian collections in America. Adjacent Casa Adobe is replica of typical rancho adobe of Spanish California days.

**PLAZA.** Circular park where Spanish governor, Felipe de Neve, brought colonists from San Gabriel Mission, nine miles east, to found pueblo of Los Angeles in 1781.

**OLD MISSION CHURCH.** Just off Plaza. Built about 1818. Lovely old paintings and museum of relics.

**OLVERA STREET.** One of first streets of pueblo. Preserved as authentic Mexican marketplace, Mexican food, craftsmen dipping candles, blowing glass, weaving huaraches.

**CIVIC CENTER.** City Hall 32 stories, tallest in Southern California; from tower you can seen snowy mountain peaks on winter days. Federal, State, County buildings grouped here. Palm-landscaped Union Railroad Station.

**PERSHING SQUARE.** Block-size city park of palms, banana trees, winter-and-summer flowers, in heart of downtown district.

**ANGELS FLIGHT.** The shortest railroad in the world; in operation since 1901 at the southwest corner of Third and Hill Streets in downtown Los Angeles. Open 6 a.m. to 12:20 a.m. 5 cents a round trip.

**CHINATOWN.** 900 North Broadway, near College Street. Quaint shops and Chinese cafes on "Gin Ling Way," (Street of the Golden Palace).

**DISNEYLAND.** In Orange County, 28 miles southeast of Los Angeles. Walt Disney's magic kingdom. Open daily 10 a.m. to 10 p.m. Admission: $1.00 adults, 50c children. Closed Mondays during Fall and Winter months.

**FARMERS MARKET.** Third Street and Fairfax Avenue. Unique shopping center for food, gifts, clothing. Dine outdoors. Closed Sundays.

## Santa Monica Bay and Costal Area

The great arc of Santa Monica Bay stretches from the Santa Monica Mountains, rising abruptly up out of the sea at the north, to the Palos Verdes ("Green Trees") headlands at the south. You will enjoy seeing:

**WILL ROGERS STATE PARK.** Late cowboy humorist's canyon ranch, with saddles and all, just as Will left them.

**SANTA MONICA.** Millions of people enjoy their first thrilling look at the Pacific Ocean from the Palisades Park, two miles of palms and lawn along the brink of the high sea cliff here. Below the cliff is "Movie Row." The swimming beach is wide and long; there are facilities for changing into bathing attire.

Santa Monica Municipal Pier stretches 1680 feet out over the booming surf. You walk out on it through a fascinating jumble of boat rooms, marine stores, tackle shops, and cafes. You can board a fishing boat here, or sail in the yacht harbor.

**VENICE.** A new beach, three miles long and 650 feet wide, one of the country's best. Sand, 14,000,000 cubic yards of it, was piped here at a cost of $3,500,000 from a nearby range of Sahara-like sand dunes, used in the film industry. There are parking areas, restrooms, sports center, children's playland.

Pershing Square in the heart of Los Angeles.

**LOS ANGELES INTERNATIONAL AIRPORT.** Airliners and war planes landing and taking off constantly from its runways; during rush periods, as many as four planes a minute.

**INGLEWOOD.** Known as the "Harbor of the Air" because of proximity to the airport and aircraft plants, such as North American where the Mustang and Sabrejet fighters are made.

**HOLLYWOOD PARK RACETRACK.** Beautifully landscaped plant, built around a lake infield where a Goosegirl presides over her flock during the Summer racing season.

**MANHATTAN BEACH.** Residence of many Los Angeles business executives.

**HERMOSA BEACH.** Municipal pier, bathing and fishing facilities. Aquarium with hundreds of sharks, octopus, sea lions, etc.

**REDONDO BEACH.** Horseshoe-shaped pier. Swimming beach, and unique Moonstone Beach where waves toss up moonstones and agates from a "drowned" canyon.

**PALOS VERDES.** Scenic headland offering magnificent views of Santa Monica Bay, the harbor, and Catalina Island. Marineland is the biggest oceanarium in world; giant fish can be viewed in huge tanks through big plate glass windows. Wayfarers Chapel, built of redwood beams and glass, is shrine dedicated to Emanuel Swedenborg.

## San Fernando Valley

Known as "The Valley." It is north of the Santa Monica Mountains and reached via a series of scenic passes.

**MULHOLLAND DRIVE.** Along the mountain crest, offers a magnificent view north over the valley and south over Los Angeles and the Pacific Ocean.

**GLENDALE.** Gateway to the valley. Forest Lawn Memorial Park is here, 306 beautifully landscaped acres containing the "Little Church of the Flowers," a replica of the tiny English church where Thomas Gray wrote his Elegy; "Wee Kirk O'the Heather" replica of Scottish church where Annie Laurie worshipped; the "Last Supper" window; and the new "Hall of the Crucifixion" housing the world's largest religious painting, "Crucifixion," by the renowned Polish artist, Jan Styka. The canvas is 45 feet high and 90 feet long. Glendale is famed for pottery works and for "Antique Alley" along Los Feliz Blvd.

**BURBANK.** Site of the giant Lockheed aircraft plant, producing the famed World War II P-38, the jet Shooting Star, the huge transport Constellation, and the Navy Neptune of world's distance record fame.

**SAN FERNANDO MISSION.** Founded by the Spanish Padres in 1797, overlooking the valley where once its great herds of cattle grazed. Long adobe main building with 18 arches. Memory Garden is one of few restored Mission gardens.

## San Gabriel Valley

The valley stretches along the foot of the mile-high San Gabriel Mountains, white with snow in Winter above the warm orange groves.

**PASADENA.** Just off the Freeway from Los Angeles, is where the Tournament of Roses floats of perfumy fresh flowers assemble for the parade on New Year's Day.

Olvera Street, brick-paved market lane of Old Mexico, in shadow of skyscraper Los Angeles City Hall.

Wilshire Boulevard, "Fabulous Boulevard" of the best-selling book, with some of the most beautiful glass-and-palm-landscaping business architecture in America.

*Old Spanish Missions of San Gabriel, built in 1771, and San Fernando, 1797, at towns of those names close by Los Angeles.*

Rose Bowl is in the Arroyo Seco ("Dry River") west of town; Brookside Park beside it has the only center built especially for flower shows.

The Civic Center, domed City Hall, Library and Civic Auditorium, is architecturally famous.

**PASADENA PLAYHOUSE.** Dean of the "little theaters," with many a movie star coming from its stage, is handy near downtown. Caltech's famed laboratories cover four city blocks.

**DESCANSO GARDENS.** World's biggest camellia gardens, operated by Los Angeles County, on oak-studded hillside in La Canada. Blooming of 48,000 camellia plants November-March; massive azalea display in April; roses in May, June, October; begonias, lilies, annuals in summer; chrysanthemums in September, and October. Stream winds through flowery display, over waterfalls and through pools. Gardens are open daily 10 a.m. to 4 p.m.

**HUNTINGTON LIBRARY.** At adjacent San Marino, exhibits such rarities as the Gutenberg Bible and a manuscript annotated by Christopher Columbus. The art gallery has Gainsborough's "Blue Boy" and Lawrence's "Pinkie."

**SAN GABRIEL MISSION** with its thick walls and old bell arches, was built in 1771 by the Spanish Padres to serve the Indians. One of the colored statues above the altar was given by Queen Marie of Spain in 1773.

**WORLD'S BIGGEST WISTARIA VINE** covers an entire acre with lavender loveliness each spring in Sierra Madre, at the foot of Mt. Wilson.

**SANTA ANITA PARK** at Arcadia is one of the most beautiful horseracing plants in the world. A million blossoms are arranged to bloom for the winter racing season.

**ORANGE GROVES.** Mile upon mile of groves, golden fruit on green trees the year around, around Azusa, Glendora, Covina.

**POMONA.** Citrus town, and site of the Los Angeles County Fairgrounds. No fairgrounds are landscaped more beautifully than these 400 acres with thousands of flowers surrounding the 52 exhibition buildings. The Palomares Adobe is an ancient home of Spanish California, over 110 years old, recently restored.

**ARABIAN HORSE FARM** of the California State Polytechnic College. Herd of purebred Arabians, among best trained in world.

**CLAREMONT,** citrus town, is the home of Pomona College, Claremont Men's College, Scripps College for Women, combined as Claremont Colleges.

**PADUA HILLS THEATER,** on a shoulder of the mountain, is the home of the Mexican Players who present Spanish-language dramas.

**WHITTIER,** at the mouth of scenic Turnbull Canyon at the south side of the valley, is a citrus town and home of Whittier College. The Pico Mansion was the home of Pio Pico, last Mexican governor of California.

**ANGELES CREST HIGHWAY,** is a high-gear highway whisking you up into the mountains, a mile high, in less than an hour. One branch of the highway goes across the mountains to Palmdale on the desert. Another goes deep in the range to pine-forested recreational flats. Another heads for

**MT. WILSON OBSERVATORY.** Visitors admitted to the 100-inch dome. Seven television transmitters are atop the peak. On clear days you see Santa Monica Bay; at night the lights of hundreds of cities in the valley below.

**ARBORETUM.** Gardens composed of plants from the world over which can be grown in this subtropical climate, being developed by the state and Los Angeles County. Open Sundays.

### Harbor and Long Beach

The view is magnificent from the Palos Verdes heights; the great port and harbor cities are laid out in panorama below.

**FORT MacARTHUR,** high up on the point guarding the harbor entrance.

**BREAKWATER,** granite mole 8.1 miles long, protecting the Outer Harbor where liners, freighters, tankers, warships ride at anchor.

**CABRILLO BEACH.** Clean, white sand and still water sheltered behind breakwater. Marine museum with 1000-pound turtle.

**SAN PEDRO,** port community. Waterfront shops display ropes, sextants, compasses, other nautical gear. All about are shipyards, lumber docks, cranes, and Municipal Fishermen's wharf.

Disneyland. Walt Disney's fabulous playground. Down Main Street U.S.A., and into Tomorrowland, Fantasyland, Frontierland, and Adventureland.


CBS Television studios.

Snow capped mountains and orange groves.

**TERMINAL ISLAND,** reached by ferry or huge folding bridge that lifts over the masts of ships using the channel. Island is almost entirely man-made, built up at cost of $12,000,000 when the harbor was dredged out of the mud flats.

**NAVY BASE,** bristling with masts and guns of warships, and huge floating crane brought from Germany.

**FISH HARBOR,** the special fisherman's harbor in this, the world's number one commercial fishing port. Docking here beside the canneries are boats that seine the offshore sardine schools, and big clippers that sail to the Galapagos Islands and South America for tuna.

**DRY DOCKS.** A big floating dry dock operates beside the island. A ship under repair can usually be seen raised in it, her huge propellor, rudder and underside high and dry.

**LONG BEACH,** second largest city in Los Angeles County, over 250,000 population, is a beach resort, oil capital, and port city.

**MAGNOLIA PIER** and Pierpont Landing are two of the piers at Long Beach; sheltered bathing and boating beach, harbor sightseeing boat.

**RAINBOW PIER,** famous "seamark" of Long Beach, 3800 feet long, enclosing 32 acres of ocean in a quiet lagoon. You can walk or drive out to sea on the pier and look back at the Long Beach skyline. The Municipal Auditorium, seating 12,500, is in a subtropical park built out into the lagoon.

**SIGNAL HILL,** huge dome bristling with derricks, looms over Long Beach like a giant pincushion; $850,000,000 worth of oil has flowed from these wells.

**MARINE STADIUM,** built for 10th Olympiad rowing races, now Long Beach's course for boat races. Colorado Lagoon is joined by a channel to the Marine Stadium, and is night-lighted for swimming, boating.

**SANTA CATALINA ISLAND,** famed as the "Magic Isle," 26 miles offshore. Island is 22 miles long, and very mountainous. Avalon village is built on the canyon floor sloping gently up from the arc of Avalon Bay.

**UNDERSEA GARDENS** are 17 miles of undersea forests and fantastic rock formations, seen through crystal-clear ocean water from the windows of the glass-bottom boat putting out from Avalon. Giant ocean goldfish and blue perch flick among the growths, a big fish may nose up to the window.

**KNOTT GHOSTTOWN.** Assembled authentically, building by building, from Old West towns of California and Arizona. Old-fashioned train ride, complete with train robbery.

## Come and See!

*A series of sight-seeing maps and booklets may be obtained without charge from the All-Year Club Free Visitors Bureau, 628 W. Sixth St., Los Angeles.*

All photographs courtesy of Los Angeles Chamber of Commerce.

# American Academy
## OF PHYSICAL MEDICINE AND REHABILITATION

# *Preliminary Program*

### SCIENTIFIC SESSION

**MONDAY, September 9 — 9 A.M.**

**Sierra Room**

Presiding — FRANCES BAKER, San Mateo, Calif.
Assisting — MORTON HOBERMAN, New York City

ADDRESS OF WELCOME

**Murray B. Forderbar, M.D., President**
**American Academy of Physical Medicine and Rehabilitation**

9:15 **Physiology of the Contraction Process.**

ROBERT B. PEARSON, M.D. (by invitation), Assistant Professor of Anatomy, School of Medicine, College of Medical Evangelists, Loma Linda, Calif.

10:30 **Functional Anatomy of the Shoulder.**

JOHN B. deC. M. SAUNDERS, M.D. (by invitation), Professor of Anatomy and Dean of the Medical School, University of California, San Francisco.

### SCIENTIFIC SESSION

**MONDAY, September 9 — 2 P.M.**

**Sierra Room**

Presiding — MAX K. NEWMAN, Detroit
Assisting — LEONARD J. YAMSHON, Los Angeles

2:00 **Functional Anatomy of Locomotion.**

VERNE T. INMAN, M.D. (by invitation), Professor of Orthopaedic Surgery, Medical School, University of California, San Francisco.

3:30 **Functional Bracing for the Severely Paralyzed Upper Extremity.**

VERNON L. NICKEL, M.D. (by invitation), Assistant Professor of Orthopaedic Surgery, School of Medicine, College of Medical Evangelists, Loma Linda, California; Chief of Surgery and of Orthopaedic Surgery, Rancho Los Amigos, Hondo, California; Senior Attending Surgeon, Brace and Prosthesis Clinic, Los Angeles General Hospital, Los Angeles.

4:00 **Mechanics of Respiration.**

JOHN E. AFFELDT, M.D. (by invitation), Assistant Professor, Internal Medicine, School of Medicine, College of Medical Evangelists, Los Angeles; Chief Physician, Respiratory Center for Poliomyelitis, Rancho Los Amigos, Hondo, California.

**OPEN DISCUSSION OF THE PAPERS PRESENTED DURING BOTH SESSIONS WILL BE MADE FROM THE FLOOR**

# AMERICAN CONGRESS OF PHYSICAL MEDICINE and REHABILITATION

## *Thirty-Fifth Annual Scientific and Clinical Session*

## Preliminary Program

## GENERAL INFORMATION

### RULES GOVERNING THE READING OF PAPERS

No paper or address before the Congress shall occupy more than fifteen minutes in its delivery. The program is so arranged that all time is utilized and it is therefore imperative that the stated time schedule be followed closely.

All papers read before the Congress shall become the property of the Congress for publication in the official journal, **ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION**. Each paper shall be deposited with the assisting officer of the session when read. No publicity shall be released concerning papers scheduled for presentation at the Congress, either before or after presentation, except through the proper officials of the American Congress of Physical Medicine and Rehabilitation.

### THE CONVENTION

The registration desk will be open at 1:00 p.m., Sunday, September 8, for registration. Tickets for the Congress/-Academy dinner will be available. It is important that everyone register before entering the meeting area. Those not wearing the official badge will be refused admission. This meeting is not open to the public. No registration fee will be charged.

### BUSINESS SESSIONS

The annual business meetings of the general membership of the Congress will be held on Tuesday, September 10, 4:00 p.m., and Thursday, September 12, 4:00 p.m.

### CONGRESS/ACADEMY DINNER

The Congress/Academy dinner will be held on Wednesday, September 11, at 7:00 p.m. Dress is optional. Exhibitors and guests are welcome.

### AMERICAN ACADEMY OF PHYSICAL MEDICINE AND REHABILITATION

The American Academy of Physical Medicine and Rehabilitation will hold its annual scientific session and business meeting on Monday, September 9.

### SCIENTIFIC EXHIBITS

Scientific exhibits will be on display and should prove of great interest to all in attendance. As is customary, medals will be awarded to those exhibits which are adjudged outstanding by the Committee on Awards for Scientific Exhibits. The awards will be announced and presented at the Congress/Academy dinner.

### TECHNICAL EXHIBITS

The program of the scientific sessions has been arranged to allow time for visits and inspection of the technical exhibits. Since these have been given considerable thought and effort, we urge every member and guest to set aside sufficient time for a complete tour of all exhibits.

Exhibits will be open from 8:30 a.m. to 5:00 p.m. on Tuesday, September 10 through Thursday, September 12 until 3:00 p.m.

### EDITORIAL BOARD

The annual meeting of the Editorial Board of the **ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION** will be held on Thursday, September 12, 6:00 p.m.

### SCIENTIFIC FILMS

Scientific films will be shown during the time of the meeting. Two series of films are scheduled for Wednesday, September 11, and Thursday, September 12, at 1:00 p.m.

### VETERANS ADMINISTRATION

Sixth Annual Conference of VA Chief Consultant and VA Area Consultants, Physical Medicine and Rehabilitation Service, Sunday, September 8, Hartford Room, 10:00 a.m. Co-Chairmen: Charles D. Shields, M.D., and A. B. C. Knudson, M.D.

Ninth Annual VA meeting for Chiefs, Acting Chiefs, Assistant Chiefs, Staff Physiatrists, Consultants and Attending Physiatrists, Physical Medicine and Rehabilitation Service; Los Angeles Room, Thursday, September 12, 12:30 p.m., at luncheon. Tickets may be purchased at desk in registration area.

## SCHEDULE OF DAILY ACTIVITIES

### 35th ANNUAL SESSION

#### SUNDAY, September 8

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| 10:00 | Meeting, Veterans Administration Consultants, Hartford Room |
| 1:00 | Registration |

#### MONDAY, September 9

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|---|---|
| 8:00 | Registration |
| 9:00 | Scientific Session, American Academy of Physical Medicine and Rehabilitation, Sierra Room |
| 10:30 | Board of Governors, American Academy of Physical Medicine and Rehabilitation, Hartford Room |
| 12:00 | Luncheon |
| 2:00 | Scientific Session, American Academy of Physical Medicine and Rehabilitation, Sierra Room |
| 4:30 | Annual business meeting, American Academy of Physical Medicine and Rehabilitation (members only), Sierra Room |

### TUESDAY, September 10

8:00 Registration — Inspection of Exhibits
9:00 Scientific Session, Sierra Room
9:00 Scientific Session, Los Angeles Room
10:00 Board of Governors, Congress, Hartford Room
12:00 Luncheon — Inspection of Exhibits
12:00 Luncheon, Committee on Advances in Education, American Congress of Physical Medicine and Rehabilitation (by invitation), Dallas Room
2:30 Formal Opening Session, Sierra Room
4:00 First Congress business meeting (members only), Sierra Room

### WEDNESDAY, September 11

8:00 Registration — Inspection of Exhibits
9:00 Scientific Session, Sierra Room
9:00 Scientific Session, Los Angeles Room
12:00 Luncheon — Inspection of Exhibits
1:00 Scientific Films, Mission Room
2:00 Scientific Session, Sierra Room
7:00 Congress/Academy Dinner, Sierra Room

### THURSDAY, September 12

8:00 Registration — Inspection of Exhibits
9:00 Scientific Session, Sierra Room
9:00 Scientific Session, Los Angeles Room
12:00 Luncheon — Inspection of Exhibits
12:30 Luncheon and Meeting, VA Personnel, Los Angeles Room
1:00 Scientific Films, Mission Room
2:00 Scientific Session, Sierra Room
4:00 Second Congress business meeting (members only), Sierra Room
6:00 Meeting and Dinner, Editorial Board, Dallas Room

### FRIDAY, September 13

8:30 Registration
9:00 Scientific Session, Los Angeles Room
10:00 Board of Governors, Congress, Hartford Room

## GENERAL SCIENTIFIC SESSION

### TUESDAY, September 10 — 9 A.M.

### Sierra Room

Presiding — CHARLES D. SHIELDS, Washington, D. C.
Assisting — HARRY T. ZANKEL, Durham, N. C.

9:00 **A Comparative Study of Antispasmodic Drugs in Patients with Spinal Cord Injuries.**

ROY H. NYQUIST, M.D., Instructor, Physical Medicine Department, Medical School, University of Southern California; Attending Staff, Los Angeles County Hospital;

A. ESTIN COMARR, M.D. (by invitation), Chief, Urology Section, and Assistant Chief, Paraplegia Service, VA Hospital, Long Beach, Calif.; Urology Section, Department of Surgery, School of Medicine, College of Medical Evangelists, and

ERNEST BORS, M.D. (by invitation), Chief, Paraplegia Service, VA Hospital, Long Beach, Calif.; Associate Clinical Professor of Surgery (Urology), Medical School, University of Southern California, Los Angeles.

The purpose of this study was to evaluate the effect of Meprobamate on the somatic and autonomic elements involved in spasticity problems and bladder function in patients with spinal cord injuries in comparison to phenobarbital and Zoxazolamine with comments on other treatments used in the past twelve years at this treatment center for spinal cord injuries.

9:15 **The Intermittent Double Step Gait.**

MIECZYSLAW PESZCZYNSKI, M.D., Associate Professor of Clinical Physical Medicine, School of Medicine, Western Reserve University; Chief, Department of Physical Medicine and Rehabilitation, Highland View Hospital, Cleveland.

A gait technic and its two varieties that many disabled persons use are described. In the first variety the patient tends to lose his balance abnormally during the stance phase of the disabled leg, and in the second he loses his balance during the swing phase of the involved lower extremity. The patient reacts to the shock of imbalance by pausing immediately after every other step. Because of these aberrations, characteristic and distinctive patterns result. The intermittent double step gait is a method applied successfully, and often found to be the only method, in training some of the severely disabled persons to walk independently and safely. Indications for prescribing the intermittent double step gait are discussed in detail.

9:30 **Evaluation of Physical Treatment in Multiple Sclerosis.**

RICHARD W. MOORE, M.D., Assistant Medical Director, California Rehabilitation Center, Santa Monica, Calif.

There is still no specific treatment for multiple sclerosis. Physical treatment, however, plays an important role in selected cases of multiple sclerosis in at least temporarily improving or maintaining the ability of the patient to continue full self care, or partial practical self care. The physical treatment program should include adequate, intensive physical treatment consisting of physical therapy, occupational therapy, gait training, corrective therapy, and speech therapy as indicated. Such a program should be carried up to the tolerance of the patient. Proper training in a home program is important, but maintaining such a program is, in most cases, unsatisfactory for any prolonged period, even when followed by periodic check-up examinations. The case histories presented demonstrate that activity in the form of supervised, intensive physical treatment is helpful and not harmful in many selected patients afflicted with multiple sclerosis. It may be concluded that until the cause and specific treatment are determined, rehabilitation in the form of intensive physical treatment is an important therapeutic approach to the management of this progressive disease. Funds, as provided through grants by the National Multiple Sclerosis Society or local chapters, should be used primarily for worthwhile reseach projects and, secondarily, for adequate physical treatment of selected cases.

**INTERMISSION — INSPECTION OF EXHIBITS**

10:15 **Ambulation Problems in Hemiplegia.**

EDWARD J. LORENZE, M.D., Medical Director, The Burke Foundation, White Plains, N. Y.; Assistant Professor of Clinical Medicine, Cornell University Medical College, New York City, and

ANTHONY J. DEROSA (by invitation), Supervisor, Physical Therapy Department, The Burke Foundation, White Plains, N. Y.

This paper constitutes a report on 250 cases of hemiplegia resulting from a variety of etiological factors including trauma, cerebral vascular accident including hemorrhage and thrombosis, cerebral embolus and others, which were admitted to the rehabilitation service of The Burke Foundation. A specific analysis of the physical, social, psychological and vocational status of these patients is included as well as the results of rehabilitation treatment. In particular, the paper analyzes those patients who failed to achieve independent ambulation; achieved only partial independence in ambulation or, who required a prolonged period of treatment before a satisfactory degree of ambulation was achieved. Ordinary problems of a general medical nature, associated amputation, fracture or arthritis and paralytic muscular factors are evaluated. However, primary stress is not placed upon these but rather on problems of cerebellar system involvement, ataxia, apraxia, perceptual problems. The specific problems of muscular weakness and spasticity are outlined.

10:30 **Physical Treatment of Backache.**

O. LEONARD HUDDLESTON, M.D., Medical Director, California Rehabilitation Center, Santa Monica, Calif.; Clinical Professor of Physical Medicine, School of Medicine, University of Southern California, Los Angeles.

Backache resulting from various etiological causes as a rule responds well to physical treatment. Satisfactory recovery and economy in time and money frequently depend upon the proper selection of physical agents and physical procedures used in the treatment of this condition. The conventional treatment of acute traumatic strains of the back usually gives good results. This therapy frequently consists of the application of some form of heat (moist, dry, or conversion), temporary immobilization such as applying adhesive strapping, wearing a sacro-iliac or lumbro-sacral belt, corset, or a back brace. Some patients with more severe strain may require additional treatment in the form of therapeutic exercises, electrical stimulation, or ultrasound therapy. However, many of these acute and sub-acute strains may be corrected very quickly and promptly by appropriate mobilization of the soft tissues and joints of the pelvis and torso. Chronic and recurrent backache usually requires more prolonged and comprehensive treatment. The program which we have found most satisfactory consists of hydrotherapy (immersion in a modified Hubbard tank and body whirlpool), followed by tissue mobilization, flexibility exercises, progressive fascial stretching, and appropriate manual mobilization of the joints. Attention in many instances must be directed toward the correction of faulty posture, foot strain, and joint abnormalities utilizing mobilization therapy and appropriate shoe corrections.

10:45 **Application of Rehabilitation Technics in Respiratory Insufficiency.**

LEON LEWIS, M.D. (by invitation), Lecturer in Medicine, Stanford University School of Medicine, San Francisco; Director, Poliomyelitis Respiratory and Rehabilitation Center, Fairmont Hospital, San Leandro, Calif.

Chronic respiratory disability is usually treated by technics applied according to the specific disease entity, not always in clear relation to the abnormal physiology which exists. There has been only limited application of the principles of rehabilitation in the management of respiratory disability. These principles would require the use of an integrated physical (respiratory assistive), pharmacologic, immunologic, psychosocial and broad medical-surgical program determined by the changing needs of the individual patient. Experience in total care of poliomyelitis patients with respiratory disability has led to a new approach to the management of other seemingly unrelated problems. Chronic respiratory insufficiency and acute crises due to pulmonary emphysema, fibrosis, atelectasis, kyphoscoliotic lung compression and many other conditions have been successfully managed by the use of any or all of the following measures: tracheostomy to diminish respiratory dead space and improve freedom of air flow; bronchodilator drugs to diminish airway resistance; mechanical respirators of many types to assure adequate ventilation and to control respiratory acidosis; oxygen to maintain an adequate partial pressure of oxygen in arterial blood; antimicrobial drugs and vaccines to eliminate infection; pneumoperitoneum to help restore diaphragm-lung relationships for effective breathing; resection of space occupying cysts or diseased lung tissue; physical and occupational therapy for general strengthening and for specific improvement of respiratory muscle function, and psychological support and social service, including vocational rehabilitation, paralleling the medical program. Representative case studies presented serve to demonstrate the effectiveness of a broad medical and rehabilitative program for respiratory disabilities.

## GENERAL SCIENTIFIC SESSION

**TUESDAY, September 10 — 9 A.M.**

**Los Angeles Room**

Presiding — WILLIAM D. PAUL, Iowa City
Assisting — HARRIET E. GILLETTE, Atlanta, Ga.

9:00 **Establishment of Clinical Norms for Peripheral Arterial Diseases by Oscillometric Methods.**

BROR S. TROEDSSON, M.D., Clinical Instructor, Department of Physical Medicine and Rehabilitation, University of Minnesota; Chief, Physical Medicine and Rehabilitation Service, VA Hospital, Minneapolis.

Disability, and ultimate loss of extremities, is increasing as a result of decreased arterial circulation due to arteriosclerosis in an aging population. Early discovery and proper management at the various stages of the disease can shorten disability and prevent amputations. Because of this, it is important to be able to evaluate the degree of arterial circulation and to localize the site of obstruction. To do this, we should have norms by which we can judge quantitatively the arterial circulation. By observation and measurement on a series of cases, using the oscillometer, it is possible to establish certain clinical norms. These norms are the gangrene point, i.e., the readings below which gangrene is imminent; the ulcer healing point, i.e., the readings below which an ulcer will heal slowly or not at all; amputation site healing point, i.e., the readings above which the amputation site will heal readily; amputation site weight bearing point, i.e., the readings above which a prosthesis can be used without fear of stump breakdown and above which there is also a margin for future deterioration of the circulation, and lower limit of normal point, or walking point, i.e., the readings below which a person will complain of symptoms of arterial insufficiency when walking. These norms have been found very useful in peripheral vascular work.

9:15 **Evaluation of the Paraffin Bath as a Form of Thermotherapy.**

CYRUS W. STIMSON, M.D., Assistant Staff, Department of Physical Medicine and Rehabilitation, Cleveland Clinic;

GERTRUDE B. ROSE, B.A., R.P.T. (by invitation), Technical Staff, Department of Physical Medicine and Rehabilitation, Cleveland Clinic, and

PAUL A. NELSON, M.D., Head, Department of Physical Medicine and Rehabilitation; Medical Director, Course in Physical Therapy, Cleveland Clinic, Cleveland.

The paraffin bath is an effective means of applying heat to the hands, wrists and elbows and to the feet and ankles. It is a valuable adjunct in local treatment of involved parts for such conditions as rheumatoid arthritis, osteoarthritis, tenosynovitis, and reflex sympathetic dystrophy. Contraindications for its use are impaired arterial or venous circulation, dermatitis, open wounds or heat sensitivity. The authors compared the effectiveness of paraffin bath, whirlpool bath, and contrast bath in heating of an extremity. A disadvantage in the past has been the difficulty in utilizing the paraffin bath for home treatment. The authors describe a safe and practical way of arranging such therapy in the home.

9:30 **Pain Threshold Measurements After Therapeutic Application of Ultrasound Microwaves and Infra-red.**

JUSTUS F. LEHMANN, M.D., Division of Physical Medicine and Rehabilitation, Ohio State University, College of Medicine;

GEORGE D. BRUNNER, R.P.T. (by invitation), Division of Physical Medicine and Rehabilitation, Ohio State University, College of Medicine, and

RICHARD W. STOW, Ph.D. (by invitation), Division of Physical Medicine and Rehabilitation, Ohio State University, College of Medicine, Columbus, Ohio.

Pain threshold measurements have been made with the Wolff and Hardy method after application of ultrasound microwaves, and infra-red to volunteers. It was found that the pain threshold was increased when these modalities were applied to the peripheral nerve trunk and the pain threshold measured in the area of the nerve distribution. The pain threshold was also elevated when these modalities were applied directly to the same area where the pain threshold was determined afterwards. These results could be obtained only if comparatively high doses were applied.

**INTERMISSION — INSPECTION OF EXHIBITS**

10:15 **Mechanisms of Thermoregulatory and Emotional Sweating Studied by Ion Transfer of Inhibitory Substances to the Skin.**

VICTOR CUMMINGS, M.D., Clinical Instructor, Department of Rehabilitation Medicine, Albert Einstein College of Medicine, Bronx Municipal Hospital Center; Full Time Assistant to Director, Department of Physical Medicine and Rehabilitation, Montefiore Hospital, Bronx, N. Y.

Local introduction into the skin of Dibenzaline and Atropine by ion transfer was carried out on patients to determine the nature of inhibition of heat regulartory and emotional sweating mechanisms. It is postulated that sweating in these two instances is mediated through adrenergic and cholinergic responses of the sweat glands. Heat regulatory sweating was produced by overheating patients appropriately. Suitable emotionally labile patients who exhibited over-reaction to mild psychological stress situations were chosen to demonstrate emotional sweating. Starch-iodine reaction and skin resistance measurements were carried out to demonstrate the state of sweating on areas tested. Results will be reported.

10:30 **Bacterial Resistance to Ultraviolet Irradiation (2537A)**

FOLKE BECKER, M.D., Chief, Physical Medicine and Rehabilitation Service, VA Hospital, and
EDWARD V. LIPSCOMB, M.S. (by invitation), Bacteriologist, Laboratory Service, VA Hospital, Dublin, Ga.

The second in a series of studies is described, relating to differences in morphology, staining characteristics, biochemical reactions, pathogenicity and photoresistance of bacteria never subjected to ultraviolet irradiation, as compared with survivor colonies of the same bacteria which have been successively irradiated up to the point of a complete kill in each instance. It is the conclusion of the authors that with the light source (2537A) and conditions employed, no photoresistance developed in a strain of M. pyogenes var. aureus nor were any mutations induced when increasing exposures of "far" ultraviolet irradiation up to the point of a complete kill were employed. This study is a follow-up of a previous study in which the light source employed was in the "near" ultraviolet portion of the electromagnetic spectrum (2900-3100A), and as a result of which similar conclusions were drawn.

## GENERAL SCIENTIFIC SESSION

**TUESDAY, September 10 — 2:30 P.M.**

**Sierra Room**

Presiding — A.B.C.KNUDSON, Washington, D.C.
Assisting — FRANCES BAKER, San Mateo, Calif.

### OPENING OF THE THIRTY-FIFTH ANNUAL SESSION

### INVOCATION

### ADDRESSES OF WELCOME

2:45 **Presidential Address**

A.B.C. KNUDSON, M.D., Director, Physical Medicine and Rehabilitation Service, Department of Medicine and Surgery, VA Central Office; Assistant Clinical Professor, Physical Medicine and Rehabilitation and Associate in Physical Medicine and Rehabilitation, George Washington University School of Medicine, Washington, D. C.

3:15 **Pneumatic Arm — Its Asset to Upper Extremity Amputee.**

EARL FRANKLIN HOERNER, M.D., Clinical Director, Kessler Institute for Rehabilitation, West Orange, N. J.

The Pneumatic Arm, devised in Germany, offers an additional asset to persons who have lost part of an upper extremity, as well as those who have a disability resulting in a flaccid upper extremity, such as quadriplegia from poliomyelitis or trauma.

The principle of this orthopedic appliance is the use of carbon dioxide gas, as the driving force or energy used in carrying out needed functional motions of the mechanical parts of the prosthetic apparatus. This gas is enclosed in a small cylinder which is contained within the prosthetic device. The person using such an apparatus controls the motion desired by releasing the gas outlet valve through pulling on a cable, using such movements as a shoulder shrug, shoulder flexion, intrascapular excursion, body (trunk) bending, or other similar procedures.

In this way, it has been possible to provide the disabled person with the following appliance motions: prehension of the hand or terminal device, pronation and supination of the forearm (a motion that has not been possible to duplicate with any other prosthetic device), elbow flexion and extension, shoulder flexion and extension. All of these motions are performed smoothly and quickly, without a time lag, and with a mild degree of energy expenditure by the wearer.

This appliance has also been found useful in assisting persons, with a flaccid upper extremity to carry out needed functional motions, by applying the energy supplied by the gas to drive the mechanical parts of an upper extremity functional arm, and/or hand, and/or shoulder brace.

3:30 **Bilateral Effects of Unilateral Exercise: Experimental Study of 120 Subjects.**

ROBERT D. KRUSE, D.P.E. (by invitation), Educational Administrator, Course in Physical Therapy, Frank E. Bunts Educational Institute (The Cleveland Clinic Foundation), Cleveland, and
DONALD K. MATHEWS, D.P.E. (by invitation), Director of Research, School of Physical Education, State College of Washington, Pullman, Wash.

The purpose of this study was to test the bilateral effects of unilateral strength-building exercises on the elbow-flexor muscles. Sixty male college students were periodically subjected to ergometric exercises of the left elbow-flexor muscle group for four weeks. Fifteen subjects exercised twice weekly, fifteen three times weekly, fifteen four times weekly, and fifteen five times weekly. A control group of equivalent size was matched to each exercising group.

The results of this study are statistically significant increases in strength and endurance of the left (exercised) elbow-flexor muscles in the groups exercising three, four, and five times weekly; no statistically significant increases in strength and endurance of the left (exercised) elbow-flexor muscles in the group that exercised twice weekly; no statistically significant increase in strength and endurance of the right (unexercised) elbow-flexor muscles in any of the experimental groups, and no statistically significant increases in strength and endurance of the flexor muscles of either elbow in any of the control groups.

3:45 **Rehabilitation of the Permanently and Totally Disabled.**

MORTON HOBERMAN, M.D., Chief, Rehabilitation and Research Service, New York State Rehabilitation Hospital, West Haverstraw, N. Y.

A review of the welfare rolls of the State of New York indicated that some recipients carried in the category of "permanently and totally disabled" might be materially aided by intensive rehabilitation. During the past two years, more than 150 of these individuals have been evaluated and treated at the New York State Rehabilitation Hospital. The most frequent diseases encountered in these patients were arthritis, cerebrovascular accidents, and traumatic transverse myelitis. Most of the patients had been physically disabled for more than two years, with some for as long as 15 years. Most of the patients had been out of work (or incapable of household activities) for at least an equal period or longer.

More than half of the patients, on initial evaluation, were considered to be either custodial or semicustodial. They were also either unemployable or only capable of doing the simplest tasks in the home area. A few who were deemed to be capable of taking care of their own needs were unable to work outside the home. Our experience with these patients indicates that almost 75% of them can be improved, and that 50% can even be moderately or markedly improved.

## GENERAL SCIENTIFIC SESSION

**WEDNESDAY, September 11 — 9 A.M.**

**Sierra Room**

Presiding — MURRAY B. FERDERBER, Pittsburgh
Assisting — DONALD A. COVALT, New York City

9:00 **Sequence of Action of the Intercostal Muscles During the Respiratory Cycle.**

GEORGE H. KOEPKE, M.D., University Hospital; EDWIN M. SMITH, M.D. (by invitation), University Hospital;
DAVID DICKINSON, M.D. (by invitation), University Hospital, and
ALMA MURPHY, Ph.D. (by invitation), University Hospital, Ann Arbor, Mich.

Previous electromyographic observations in the laboratory indicated that the first intercostal muscle and diaphragm were used in quiet breathing but that expiration occurred passively. A subsequent investigation has been made of the sequence of action of intercostal muscles at measured lung volumes during the various intervals of the respiratory cycle. The measurements of lung volumes were synchronized with the electromyographic activity of the intercostal muscles of normal men. The activity of several muscles was recorded simultaneously, by means of the multiple channel electromyograph using the needle technic. The evidence indicates that the intercostals were serially recruited with deeper breathing. In most instances the first intercostal muscle showed electrical activity at the onset of inspiration. As this inspiration deepened there was successive recruitment of the second through the eleventh intercostal muscles. A forced expiration occurring during the interval of tidal inspiration was accompanied by activity of the lower intercostals, followed by the upper intercostal muscles if additional expiratory effort was made.

9:15 **Occurrence of Myotonic Patterns in Electromyography.**

JOSEPH G. GOODGOLD, M.D., Brooklyn, and
KENNETH C. ARCHIBALD, M.D. (by invitation), New York City.

The occurrence of chains of high frequency oscillating electrical potentials combined with a characteristic "dive bomber" audio output is most usually associated with the classical myotonias

((myotonia congenita and myotonia dystrophica). It has been our experience however, that this phenomenon is by no means pathognomonic of these disease entities. It appears rather that such characteristic potentials are most likely a manifestation of increased muscle irritability and are also seen in a variety of conditions including progressive muscular dystrophy, progressive muscular atrophy, and in various peripheral neuropathies. This manuscript presents an analysis of the cases studied in the electrodiagnostic laboratory at the Institute of Physical Medicine and Rehabilitation in New York City over the past two years along with a review of the literature and a discussion of etiological background of "myotonic" discharges.

9:30 **Some Unusual Electromyographic Findings.**

BERNARD J. DOYLE, M.D., Clinical Instructor in Physical Medicine and Rehabilitation, School of Medicine, Tufts University; Assistant Chief, Physical Medicine and Rehabilitation Service, VA Hospital, and

HENRY E. FIDROCKI, M.D. (by invitation), Research Assistant in Medicine, School of Medicine, Tufts University; Career Resident, Physical Medicine and Rehabilitation, VA Hospital, Boston.

The electromyograph continues to be a valuable instrument in the armamentarium of a physical medicine department for the diagnosis and differential diagnosis of many neurological conditions. When used frequently, diligently, and intelligently, electromyography will, in addition to the many well-recognized findings, also uncover certain unusual and unexpected findings which require interpretation. This paper includes a number of case histories and describes the unusual findings in each. It also attempts to explain the electromyographic observations thereby increasing the usefulness of electromyography to a greater field of indications. Included in the case reports are a case of familial periodic paralysis showing myotonic-like discharges in the recovery stage and also a case of myotonia diagnosed on the basis of the characteristic electromyographic which preceded the clinical observations of mechanical and electrical myotonic reactions by some time.

**INTERMISSION — INSPECTION OF EXHIBITS**

10:15 **The Use of Cinefluorography for Evaluation of Normal and Abnormal Function of the Cervical Vertebrae.**

FREDERIC J. KOTTKE, M.D., Department of Physical Medicine and Rehabilitation, University of Minnesota Medical School, and

RICHARD G. LESTER, M.D. (by invitation), Department of Radiology, University of Minnesota Medical School, Minneapolis.

A fluoroscopic intensifier system is described which makes possible the use of cinematographic recording of cervical vertebrae during motion. This apparatus exposes the patient to less radiation than does an ordinary fluoroscopic examination. The positions and relationships of the vertebrae through the full range of motion are recorded on 16 mm. film at 16 frames per second. Studies of normal and abnormal relationships are demonstrated.

10:30 **A Portable Standing Bed and Its Use in the Treatment of Long Term Disabled Patients.**

LEWIS A. LEAVITT, M.D., Chief, Physical Medicine and Rehabilitation Service, VA Hospital; Assistant Professor of Physical Medicine and Rehabilitation, Baylor University College of Medicine, Houston.

Portable standing beds that are fabricated by the PM&R Service are utilized throughout this general medical and surgical hospital in the treatment of long term paraplegic, quadriplegic, hemiplegic or chronic neurological patients. This standing bed is quite similar to those commercially available but with additional modifications. In the scheme of total rehabilitation, this type of portable standing bed is fabricated within the manual arts therapy clinic by patients engaged in either industrial therapy or in manual arts therapy. In the fabrication of such portable standing beds, various patients will attain rather complete prevocational exploration in several fields as suggested by consultations with the vocational counselor. Thus, a patient who is receiving prevocational evaluation as a draftsman or a draftsman's helper will make the detailed drawing and blueprints to scale of the entire bed and its working components. Another patient who is under prevocational evaluation as to his ability to interpret such blue prints will, in turn, work in the machine shop and cut the necessary material from a supply of wrought iron. A third patient will then assemble and weld the metal and a fourth patient will then upholster the top of the bed and the footrest upon which disabled patients will receive therapeutic activities as prescribed by physiatrists. If these patients who are receiving such prevocational evaluation of their abilities in drafting, reading of blueprints, metal work and upholstering can do this satisfactorily, then they can be set up in a vocational program following discharge from the hospital, either in a job situation or in a retraining program. This paper will outline in more detail our program in the utilization of this bed in its entire concept, various modifications and attachments as well as visual slides.

10:45 **Combined Use of Ultrasound in Hydrocortisone in the Management of Bursitis and Soft Tissue Injury.**

EUGENE L. COODLEY, M.D. (by invitation), Consultant, Cedars of Lebanon Hospital, Los Angeles; Consultant, California Department of Vocational Rehabilitation; Instructor, Department of Medicine, College of Medical Evangelists, Loma Linda, Calif.

A study of the management of bursitis by the combined use of ultrasound and hydrocortisone has recently been completed. A new, more concentrated, form of hydrocortisone containing 150 mg./cc. has been administered intra-articularly or intra-bursally followed by the use of ultrasonic therapy locally to 47 patients with bursitis, arthritis, and varied soft tissue injuries. Most of these patients were suffering from post-traumatic legions affecting the shoulder, elbow, or knee. The group included 19 cases of subdeltoid and subacromial bursitis, 10 cases of epicondylitis, 8 cases of patellar bursitis, and 10 cases of post-traumatic arthritis, acute and chronic, involving a single joint. Indications for local hydrocortisone have been single joint involvement in arthritis, generalized arthritis with a single joint predominating or in patients unable to tolerate systemic steroids, bursitis with or without calcification, and as an aid to physical therapy where pain had prevented mobilization of an area. The hydrocortisone was administered intra-articularly or intra-bursally every five to seven days. Ultrasonic therapy has been used in a variety of conditions. The combined regimen proved particularly useful in clearing certain troublesome symptoms. The relief of pain in elbows was striking, the relief of recurrent effusion in knees was unusual, and the improvement in shoulder motion was more marked than usually found. An average of 10 days was required for epicondylitis; an average of 3 weeks' therapy was needed for subdeltoid and subacromial bursitis; and an average of 3 weeks' therapy was needed for patellar bursitis. No toxicity other than transient increase in pain for a few hours following hydrocortisone instillation was noted.

## GENERAL SCIENTIFIC SESSION

**WEDNESDAY, September 11 — 9 A.M.**

**Los Angeles Room**

Presiding — FRITZ FRIEDLAND, Boston

Assisting — GLENN GULLICKSON, JR., Minneapolis

9:00 **Rehabilitation of the Rheumatoid Patient.**

DOMINIC A. DONIO, M.D., Lecturer in Medicine, Hahnemann Medical College, Philadelphia; Director, Department of Physical Medicine and Rehabilitation, Sacred Heart Hospital, Allentown, Pa., and

STEVEN HOROSCHAK, B.S. (by invitation), Associate Director, Medical Research, National Drug Co., Philadelphia.

Our clinical experiences in the management of rheumatoid arthritis have demonstrated that a positive approach to rehabilitation consists of adequate medical treatment and a well-directed physical therapy program. The response of the patient to physical therapy will be enhanced if attention is given to the correction of capillary defects, the nutritional status of the patient, and modification of the anxiety tension states observed so frequently in the rheumatoid patient.

With adequate attention given these factors, and recognizing the importance of physical therapy in the rehabilitation program, the therapeutic profits in these cases will be greatly increased, and, we hope, many patients will be salvaged from severe invalidism.

9:15 **The Problem of Paralytic Dislocation of the Hip in the Rehabilitation of Children with Poliomyelitic Sequelae.**

ALFONSO TOHEN ZAMUDIO, M.D. (by invitation), Head, Department of Physical Medicine and Rehabilitation, Hospital Infantil de Mexico;

LUIS SIERRA ROJAS, M.D. (by invitation), Head, Department of Orthopedics, Hospital Infantil de Mexico, and

LUIS GUILLERMO IBARRA, M.D. (by invitation), Extern, Department of Physical Medicine and Rehabilitation, Hospital Infantil de Mexico, Mexico City.

The paralytic dislocation of the hip (poliomyelitic sequelae) has been a serious problem in the rehabilitation of children with poliomyelitis, at the Hospital Infantil de Mexico. This study covers 960 cases of children with poliomyelitic sequelae; 64.66 per cent of the cases were in children under three years of age. In 93 random cases the following conditions were present — 35 normal hips, 42 cases of preluxation, 14 subluxated hips, and 4 dislocated hips. These last three groups, considered as abnormal, represent 63.16 per cent of problem hips in which the onset of the disease was evident in patients under three years of age. The pathological mechanics which may be con-

sidered responsible for the problem are analyzed. Four main factors were found to be determinant, leaving age as a predisposing cause. Such factors having a variable influence were imbalance between abductor and adductor muscles of the hip; imbalance between quadratus lumborum and abdominal muscles; contracture of iliotibial band on the opposite side of the dislocated hip, and increase of the acetabular angle, and muscular imbalance. These factors were found in isolated or combined form. The per cent of each one of these factors in problem hips is pointed out according to their importance. The preventive treatment based on the neutralization of the four factors mentioned is discussed. Presentation is made of a surgical plan of treatment for dislocated hips, following a new technic studied at the Hospital Infantil de Mexico.

9:30 **Trochanteric Bursitis: Diagnostic Criteria and Clinical Significance.**

THOMAS P. ANDERSON, M.D., Director, Department of Physical Medicine and Rehabilitation, Mary Hitchcock Memorial Hospital, Hanover, N. H.

A review of the literature would imply that trochanteric bursitis of the hip is rare. Most reports deal with "acute calcific bursitis." It is chronic trochanteric bursitis, a more common condition but often unrecognized because of its subtlety, for which an attempt is made in this study to provide criteria for its diagnosis. An analysis is made of pertinent factors in the history and physical examination of 32 cases. In considering whether or not trochanteric bursitis is a separate clinical entity, it is shown that in more than 50 per cent of these cases the bursitis was associated with some other painful situation in the same lower extremity or the back.

**INTERMISSION — INSPECTION OF EXHIBITS**

10:15 **Problems of the Upper Extremities.**

W. KENNETH LANE, M.D., Consultant, Respiratory and Rehabilitation Center Services, National Foundation for Infantile Paralysis, Inc., New York City.

Now that more and more patients with severe respiratory poliomyelitis are living, and recent years have brought advancement in the care of traumatic quadriplegia, we have a large number of severely involved patients with little or no function of the upper extremity. There are relatively few places in the country where the complete team approach can give to these patients a semblance of function of the upper extremity. Needed for a successful program are a physician with a knowledge, ability and interest to prescribe and supervise the training for upper extremity braces and gadgets; an occupational or physical therapist with the skill and time to train the patient in the use of these devices; an orthotist having the knowledge of metals, plastics and functional anatomy who can make and modify these devices, and a patient with drive, interest and sufficient "hardware tolerance" to make effective use of the devices. These requirements will be discussed with emphasis on the problems in these areas and some ideas for possible solution. Several slides showing patients utilizing some new pieces of equipment including electronic devices will be shown.

10:30 **Pre-Vocational and Vocational Training for the Cerebral Palsied.**

JOSEPH E. MASCHMEYER, M.D., Assistant Clinical Professor, Department of Physical Medicine and Rehabilitation, College of Medical Evangelists, Los Angeles;

MARGARET H. JONES, M.D. (by invitation), Associate Professor, Department of Pediatrics, University of California, Los Angeles;

ALDO BAIRO (by invitation), Vocational Training Director, United Cerebral Palsy Association, Vocational Training Center;

PAT HOLSER (by invitation), Occupational Therapist, United Cerebral Palsy Association, Vocational Training Center, and

CYNTHIA BLACKBURN (by invitation), Social Worker, United Cerebral Palsy Association, Vocational Training Center, Los Angeles.

In 1952 the United Cerebral Palsy Association of Los Angeles County opened its pre-vocational and vocational Industrial Training Workshop in Los Angeles. Applicants are screened by a team of specialists, and routine laboratory procedures are carried out. Applicants can be divided into two main groups namely those with potential for industrial employment, and those too severely handicapped to compete in industry. Trainees follow individualized programs directed toward fullest development of potential. Some, because of limitations, receive training only in the activities of daily living. The Industrial Training Workshop simulates actual industrial employment conditions, insofar as possible. Equipment is ingeniously adapted to the special needs of trainees. The Center is on a nearly self-supporting basis. Goals of the Center are to train severely handicapped cerebral palsied adults for self-sufficiency in activities of daily living; to train and place potentially capable cerebral palsied individuals in private industry; to determine basic standards for recognizing potentialities at an age earlier than now possible; a research program to determine the results of this "sum-total push" program is now being carried out; to determine correlation between dexterity and coordination, and future work potential. The records of this Center will furnish basic statistics in many aspects of cerebral palsy.

10:45 **Evaluation of Rehabilitation of the Severely Handicapped Cerebral Palsied Child.**

ABRAHAM O. POSNIAK, M.D. (by invitation), Assistant Professor of Physical Medicine and Rehabilitation, Department of Physical Medicine and Rehabilitation, New York Medical College, Metropolitan Medical Center; Chief, Children's Rehabilitation Division, Department of Physical Medicine, Bird S. Coler Hospital;

PHOEBE SATUREN, M.D. (by invitation), Instructor, New York Medical College, Metropolitan Medical Center, Department of Physical Medicine and Rehabilitation; Fellow in Physical Medicine and Rehabilitation, Bird S. Coler Hospital;

JEROME S. TOBIS, M.D., Professor and Director, Department of Physical Medicine and Rehabilitation, New York Medical College-Metropolitan Medical Center; Director, Department of Physical Medicine and Rehabilitation, Bird S. Coler Hospital, New York City, and

HELEN M. WALLACE, M.D. (by invitation), Professor of Maternal and Child Health, School of Public Health, College of Medical Science, University of Minnesota, Minneapolis.

The experience of the children's cerebral palsy unit of the department of physical medicine and rehabilitation of the New York Medical College-Metropolitan Medical Center since its inception in October, 1954, has been reviewed. Based on the work with 53 severely disabled cerebral palsied children, with multiplicity of intellectual and physical handicaps, an attempt has been made to assess objective functional improvement in major activities of self-care and ambulation. Criteria were set up to determine the amount of capacity to function in feeding, dressing, toileting, ambulation, and speech, on admission and at time of study. An assessment of the results of an active rehabilitation program for this severely handicapped group has been made with a discussion of the special goals that must be set, the factors which affect progress in these major areas, and the additional gains that can be seen will be presented.

## SCIENTIFIC FILMS

**WEDNESDAY, September 11 — 1 P.M.**

**Mission Room**

**Progressive Ambulation Training:** *Color, silent, 25 minutes.*
Presented by O. Leonard Huddleston, M.D.

**Discussion**

**Gait Studies of the Severely Handicapped Hemiplegic Patient:** *Color, silent, 24 minutes.*
Presented by Mieczyslaw Pezczynski, M.D.

**Discussion**

**Home Care — An Approach to the Treatment of Chronic Disease:** *Black and white, sound, 30 minutes.*
Presented by Health & Welfare Materials Center, New York City.

**Discussion**

## GENERAL SCIENTIFIC SESSION

**WEDNESDAY, September 11 — 2 P.M.**

**Sierra Room**

Presiding — JEROME S. TOBIS, New York City
Assisting — ROY H. NYQUIST, Long Beach, Calif.

2:00 **Seventh John Stanley Coulter Memorial Lecture.**

FRED B. MOOR, M.D., Professor, Physical Medicine and Rehabilitation, School of Medicine; Medical Director, School of Physical Therapy, College of Medical Evangelists, Los Angeles.

2:15 **Nutrition and Dental Care in a Physical Medicine and Rehabilitation Program.**

SIDNEY I. SILVERMAN, D.D.S. (by invitation), New York Medical College; Assistant Clinical Professor, Department of Physical Medicine and Rehabilitation, and

JEROME S. TOBIS, M.D., Professor and Director, Department of Physical Medicine and Rehabilitation, New York Medical College-Metropolitan Medical Center; Director, Department of Physical Medicine and Rehabilitation, Bird S. Coler Hospital, New York City.

There is prevalent today a relatively widening gap between carefully planned and prepared dietary requirements of chronically ill patients and the actual ingestion of these diets. One of the major causes of this gap is the character of the dental care rendered to both the homebound and the institutionalized chronically ill patient. The quantity of food and the selection of food ingested by patients are influenced and conditioned by dental treatment and the general state of masticatory efficiency of the patient. The ingested diet is also conditioned by the social dietary history of the patients, the grouping of the patients at mealtime, the frequency of mealtime, the availability and the character of supplementary meals. Dental care when carefully integrated in the scheme of physical medicine and rehabilitation programming can broaden considerably the base of general supportive therapy, not only in implementing nutritional treatment of the patients, but also in contributing to their speech capacity and general esthetic appearance. Thus adequate dental care, with emphasis on the prosthodontic considerations aid in the psychological adjustment of the patients in the management of their chronic illness.

2:30 **Physical Medicine and Rehabilitation in a Chronic Disease Hospital.**

JEROME S. TOBIS, M.D., Professor and Director, Department of Physical Medicine and Rehabilitation, New York Medical College-Metropolitan Medical Center; Director, Department of Physical Medicine and Rehabilitation, Bird S. Coler Hospital;

MILTON LOWENTHAL, M.D., Associate Professor, Department of Physical Medicine and Rehabilitation, New York Medical College; Chief of Clinical Services, Department of Physical Medicine and Rehabilitation at Flower and Fifth Avenue Hospitals, Bird S. Coler Hospital and Metropolitan Hospital, and

IRA BELMONT, Ph.D. (by invitation), New York Medical College, Flower and Fifth Avenue Hospitals, New York City.

One of the major health problems in America today is care of the chronically ill, especially the elderly patient. Physical medicine and rehabilitation offers a major contribution to the care of such patients in chronic disease hospitals, nursing homes and old age homes. This report deals with the multiplicity of services that have been developed by the physical medicine and rehabilitation department in a 2,000 bed municipal chronic disease teaching hospital. Subjects discussed include ward patient care, sheltered workshop program, prosthetic clinic, occupational therapy program for a psychiatric service, hospital-wide activities of daily living program, education and research. Of particular interest is a statistical analysis of the services provided, the active sheltered workshop program, problems in the management of young adult patients in a chronic disease set-up, accident control, and the children's rehabilitation program. A discussion of the problems encountered may assist others in dealing with patients in similar or analagous medical settings.

2:45 **A Method for the Quantitative Measurement of Spasticity and its Response to Therapy.**

WILLIAM J. ERDMAN, II, M.D., Director, Department of Physical Medicine and Rehabilitation, Hospital of the University of Pennsylvania, and

ARTHUR J. HEATHER, M.D. (by invitation), Fellow, National Foundation for Infantile Paralysis, Inc.; Assistant Instructor in Physical Medicine and Rehabilitation, Department of Physical Medicine and Rehabilitation, Hospital of the University of Pennsylvania, Philadelphia.

The need for a method whereby spasticity can be measured quantitatively is well recognized. By such a method the accurate evaluation of the effectiveness of anti-spasticity drugs as well as other forms of therapy can then be judged objectively in a more scientific manner. This paper deals with a method of measurement and recording of muscle tension and electrical potential of the muscle in response to a mechanical stimulus of known magnitude. These findings are recorded by the use of a two-channel direct writer. The achilles tendon was stimulated mechanically. The muscle tension developed was measured by a strain gauge which recorded the pressure. A skin electrode was used in recording the electrical potential of the muscle. Patients with spastic phenomena were evaluated before medications or other specific anti-spasticity therapy was given. After therapy the same patients were re-examined by the same technic and the serial findings were compared.

3:00 **Spastic Hemiparesis: Surgery as an Aid in Reeducation.**

WALTER J. TREANOR, M.D., Clinical Instructor in Medicine, Stanford University School of Medicine; Chief, Physical Medicine, St. Mary's Hospital, San Francisco.

Peripheral nerve interruptions and tendon transfers were used as aids in the re-education of paretic muscles in a small number of patients with spastic hemiparesis. Such surgical procedures were performed on 78 of a total of 403 patients. They were advised for patients who, despite conventional conservative therapy, showed progressive or established muscle imbalances. Most commonly, nerve interruptions were performed on tibial branches to the posterior calf muscles, on femoral branches to the rectus femoris and/or vastus lateralis, and on median branches to the flexor-pronator muscles of the forearm. Temporary reversible conduction blocks were performed on all but four patients. Operations on end-organs included transfers of the tibialis anticus to the middle cuneiform, of the wrist flexors to the thumb abductors and finger extensors. Tenotomies were performed on the rectus femoris, ilio-tibial band, brachio-radialis and palmaris longus. With increasing experience in the employment of these procedures, they are recommended at an earlier stage in recovery in an increasing proportion of patients. The results of re-education following surgery on the lower extremity were considered to be excellent in 64 of a total of 73 patients. A much lower percentage of successful results (14 out of 33 operations) was observed following operations on the upper extremity.

3:15 **Comparative Strength of Neck Flexor Muscles in Normal and Post-Poliomyelitis Children: A Preliminary Study.**

THOMAS HUMPHREY, B.S., R.P.T. (by invitation), Chief Physical Therapist, California Rehabilitation Center, Santa Monica, Calif., and

DAVID RUBIN, M.D., Instructor in Physical Medicine, University of Southern California Medical School, Los Angeles; Department of Physical Medicine, and Attending Staff, Sawtelle VA Hospital, West Los Angeles.

This study was prompted by the questions what is the "normal" strength of a child's neck flexors? and is it possible to develop an objective measure for determining the degree of weakness in the neck flexors of post-poliomyelitis children? A group of 76 children between the ages of 3 and 12 was tested; 32 of this group were "normal" controls and 44 were post-poliomyelitis patients. For the purpose of the test the subjects were divided into three age categories: group A from 3-6 years, group B from 6-9 years, and group C from 9-12 years. By utilizing a fixed supine position and free active motion a base line of performance was obtained. Resistance was then added by means of an adjustable head strap, weight pan, and weights. The preliminary results demonstrated that there is a great variance in neck flexor strength in both post-poliomyelitis and non-poliomyelitis children. Certain interesting observations were made relative to neck flexor strength within each group, between the two groups, and on the basis of body type.

3:30 **Parkinsonism: Report of a Case.**

RAOUL C. PSAKI, M.D., Chief, Physical Medicine Service, Tripler U. S. Army Hospital, and

GORDON T. WANAMAKER, M.D. (by invitation), Chief, Neurosurgical Service, Tripler U. S. Army Hospital, Honolulu, Hawaii.

This case is presented to bring out one of the pitfalls in the use of chemopallidectomy and selective reeducation exercises for Parkinsonism. The landmarks used were those for the occidental whereas the patient under consideration was an oriental. The differences in headsize of the two types undoubtedly were partially responsible for the less than adequate results which were anticipated. This study is presented so that others may avoid this problem in the future.

## GENERAL SCIENTIFIC SESSION

**THURSDAY, September 12 — 9 A.M.**

**Sierra Room**

Presiding — EVERILL W. FOWLKS, Portland, Ore.
Assisting — SEDGWICK MEAD, Vallejo, Calif.

9:00 **Use of a Hip Abduction Brace in Adults in the Treatment of Hip Adduction Contractures.**

GERALD G. HIRSCHBERG, M.D., Lecturer in Physical Medicine, Stanford University School of Medicine, San Francisco; Chief, Department of Physical Medicine and Rehabilitation, Alameda County Institutions, San Leandro, Calif.

Various types of hip abduction appliances are in use for the treatment of congenital hip dislocation in infants. Such appliances have not been used in adults because they cannot correct congenital dislocation of a hip at a later stage and probably also because it does not seem practical and comfortable to use such an appliance in adults for any condition. This paper presents a number of case studies in which hip abduction braces have been a valuable adjunct in rehabilitation. The conditions treated by a hip abduction brace were spasticity of hip adductors caused by cerebral palsy or spinal cord injury, and adduction contracture of both hips in cases of rheumatoid arthritis and one case of osteochondro dystrophy. In all cases there was marked gain in the range of hip abduction and considerable improvement in gait. Several types of hip abduction braces were used. The type of brace as well as the method of use is discussed.

9:15 **Types of Prosthetic Replacements in Amputees Past Fifty.**

MANFRED R. BLASHY, M.D. (by invitation), Chief, Department of Physical Medicine and Rehabilitation, VA Hospital, and

HENRY V. MORELEWICZ, M.D., Assistant Professor, Department of Therapeutics, University of Buffalo School of Medicine; Chief, Department of Physical Medicine and Rehabilitation, Edward J. Meyer Memorial Hospital, Buffalo.

This paper will discuss the requirements which a patient must meet before any type of prosthesis can be prescribed. Included is an evaluation of the component parts that make up a specific prosthesis to meet the needs of the amputee past the age of fifty. Finally, whenever a patient needs a replacement or an additional prosthesis, what factors must be met to give the patient an adequate prosthesis will be mentioned. The paper will be supplemented with slides.

9:30 **An Improved Prosthesis for Hemipelvectomy.**

SHYH-JONG YUE, M.D. (by invitation), Instructor, Department of Physical Medicine and Rehabilitation, College of Physicians and Surgeons, Columbia University; Visiting Fellow, Presbyterian Hospital; Training Fellow, Institute for the Crippled and Disabled, and

CHARLES R. GOLDSTINE (by invitation), Director, Prosthetic and Orthopedic Appliance Laboratories, Institute for the Crippled and Disabled, New York City.

Hemipelvectomy, or interinnomino-abdominal amputation, is an extensive surgical operation, usually for malignancy. The early high operative mortality has been markedly reduced and the operation is being performed more frequently, with the result that the current problem today is one of rehabilitation, particularly the development of a suitable, comfortable and functional prosthesis. Even as recently as 1947, reports in the literature complain of the lack of a good prosthesis. Early prostheses consisted of a large leather bucket to support the lower abdominal tissues, the bucket bearing a conventional above-knee limb. Difficulties with this prosthesis were excessive telescoping of soft tissue into the bucket and, apparently due to lack of support, excessive pressure exerted in the groin and perineum. Our experience in the use of molded plastic prosthetic devices led to the exploration of the use of this material in hemipelvectomy protheses. Attempts were made to combat the disadvantages of the early leather prostheses. Prostheses for ten patients were made to fit the lower abdomen on the amputated side, thus giving firm support so that the telescoping could be considerably reduced. In addition, a bridge extending from the lower part of the bucket across the midline to engage the remaining ischial tuberosity, took over a portion of the weight-bearing. An analysis is presented of the experience of these patients who, wearing this type of prosthesis, felt considerable increase in their sense of security, thus improving gait pattern. Some problems of comfort and utility still remain unsolved.

**INTERMISSION — INSPECTION OF EXHIBITS**

10:15 **Rehabilitation of Elderly Double Above Knee Amputee.**

MILTON LOWENTHAL, M.D., Associate Professor, Department of Physical Medicine and Rehabilitation, New York Medical College; Chief of Clinical Services, Department of Physical Medicine and Rehabilitation, Flower and Fifth Avenue Hospitals, Bird S. Coler Hospital and Metropolitan Hospital;

ABRAHAM O. POSNIAK, M.D. (by invitation), Assistant Professor of Physical Medicine and Rehabilitation, Department of Physical Medicine and Rehabilitation, New York Medical College, Metropolitan Medical Center; Chief, Children's Rehabilitation Division, Department of Physical Medicine, Bird S. Coler Hospital, and

JEROME S. TOBIS, M.D., Professor and Director, Department of Physical Medicine and Rehabilitation, New York Medical College-Metropolitan Medical Center; Director, Department of Physical Medicine and Rehabilitation, Bird S. Coler Hospital, New York City.

Though not commonly encountered, the elderly double above knee amputee presents one of the most difficult problems in rehabilitation. Clinical experience with a small group of these patients indicates that there are a number of significant factors related to incidence, age, distribution, complicating diseases, selection of patients for prostheses, the type of prosthesis, stubbies or full length limbs, the rehabilitation goals and the feasibility of these patients functioning in the community. This presentation offers some solutions in relation to these problems and suggestions as to areas requiring further clarification and investigation.

10:30 **Employability Following Poliomyelitis.**

MILAND E. KNAPP, M.D., Clinical Professor of Physical Medicine and Rehabilitation, University of Minnesota; Chief, Physical Medicine and Rehabilitation, Elizabeth Kenny Institute, and

LEWIS SHER, M.D. (by invitation), Clinical Assistant of Pediatrics, University of Minnesota; Director of Out-Patient Department, Elizabeth Kenny Institute, Minneapolis.

This paper is a statistical study of the effect of poliomyelitis upon the employability and economic status of 6750 patients discharged from the Elizabeth Kenny Institute from 1942 through 1955. This information is correlated with the type and severity of involvement and the age at which the patient contracted poliomyelitis.

10:45 **Studies of Conditions for Optimum Work Output in Elbow Flexion, Shoulder Flexion, and Grip Ergography.**

H. HARRISON CLARKE, Ed. D., Research Professor, School of Health and Physical Education, University of Oregon;

WILLIAM POPOWICH (by invitation), Graduate Student, School of Health and Physical Education, University of Oregon, Eugene, Ore.;

EVERETT A. IRISH, M.S. (by invitation), Department of Physical Education, Central Washington College of Education, Ellensburg, Wash., and

GARLAND TRZYNKA, M.S. (by invitation), Department of Physical Education, High School, Parkrose, Ore.

Use of the Kelso-Hellebrandt ergograph in single-exercise bouts of the elbow flexor and shoulder flexor muscles has been previously reported. The essential feature to achieve precision was the determination of proper load for each movement; this was found as proportionate strength of exercised muscles. For an eight-inch lever arm and with cadence of 30 repetitions per minute, the proportions were: three-eighths elbow flexion strength for elbow flexion ergography; and five-eighths shoulder flexion strength for shoulder flexion ergography. These proportions produced repeatable results, not necessarily optimum work output. The present study investigated conditions which would produce optimum work output for the elbow flexors, shoulder flexors, and gripping muscles. In each instance, experimentation was had with five cadences and five proportionate strengths, a total of 25 conditions. Exercise sessions were limited to two minutes; and the ergographic lever arm was kept constant at eight inches. Work output was the product of load in grams and cumulative distance load was raised. The optimal work output conditions were: elbow flexors, one-fourth proportion at 76 cadence; and gripping, one-half proportion at 76 cadence.

## GENERAL SCIENTIFIC SESSION

**THURSDAY, September 12 — 9 A.M.**

**Los Angeles Room**

Presiding — CARL C. HOFFMAN, Denver

Assisting — GUSTAVE GINGRAS, Montreal, Que., Canada

9:00 **Evaluation of Pressure as a Factor in the Production of Ischial Ulcers.**

MICHAEL KOSIAK, M.D. (by invitation), Fellow in Physical Medicine and Rehabilitation, National Foundation for Infantile Paralysis, Inc., Department of Physical Medicine and Rehabilitation, University of Minnesota Medical School;

WILLIAM G. KUBICEK, Ph.D. (by invitation), Department of Physical Medicine and Rehabilitation, University of Minnesota Medical School;

MILDRED OLSON, B.S. (by invitation), Department of Physical Medicine and Rehabilitation, University of Minnesota Medical School;

JEAN N. DANZ, B.S., O.T.R. (by invitation), Department of Physical Medicine and Rehabilitation, University of Minnesota Medical School, and

FREDERIC J. KOTTKE, M.D., Chairman, Department of Physical Medicine and Rehabilitation, University of Minnesota Medical School, Minneapolis.

Ischial decubital ulcers in patients with spinal cord injuries have always been one of the more serious problems interfering with general maintenance and total rehabilitation. Ulceration is due to tissue ischemia caused by a mechanical sitting pressure which exceeds the tissue capillary pressure, especially over the ischial tuberosities. Limiting sitting time, frequent changing of position, using sponge rubber and alternating air pressure cushions have done little to reduce the incidence of ulcer formation in even the most conscientious patient with only lower cord involvement. In the quadriplegic patient, the problem is of even greater importance.

Pressures were measured beneath the ischial tuberosities and at ten other points under the sitting area while subjects sat in several types of chairs including a contoured alternating-pressure wheelchair. Attempts were made to determine the position and exact amount of pressure over the entire sitting area in a group of normal and paraplegic subjects. The differences and distribution of pressure which prevailed in the various seats were recorded.

Preliminary studies indicate that the pressure varies directly with the weight of the patient. On a nearly flat surface most of the pressure is concentrated beneath the ischial tuberosities and exceeds the systolic pressure. On a contoured seat the pressure is distributed more widely but at all points generally exceeds the diastolic pressure.

Mechanical and physiological factors related to the relief of pressure and ischemia will be discussed.

9:15 **Physical Treatment Employed in the Rehabilitation of a Patient With Morquio's Disease.**

ROY T. McREYNOLDS, M.D. (by invitation), California Rehabilitation Center, and

O. LEONARD HUDDLESTON, M.D., Medical Director, California Rehabilitation Center, Santa Monica, Calif.; Clinical Professor of Physical Medicine, School of Medicine, University of Southern California, Los Angeles.

A seven-year-old boy with Morquio's disease was treated at an acute hospital for correction of progressive deformities of his trunk. Complete flaccid paralysis developed at T 11 following a spinal fusion. A partial laminectomy resulted in partial return of sensory and motor function. Bilateral fractures of the femora occurred three months later when the father attempted to teach the child to walk. During the course of treatment of the fractures, trophic ulcers developed on the back, knees, and ankles. The bones eventually healed and the patient was sent to our rehabilitation center for appropriate physical treatment. The ulcers were healed by using a heat cradle and placing the patient in a sawdust bed. Severe contractures of the hips and knees were present, in addition to the paresis and paralysis of the muscles of the lower extremities. Physical treatment in the form of neuromuscular re-education, hydrotherapy, mobilization therapy, gait training, and self-care training over a period of eleven months enabled the patient to learn to walk with the aid of crutches and long-leg braces. The vital capacity of the patient doubled by the use of breathing exercises and mobilization therapy. The patient will be presented.

9:30 **Some Factors Influencing the Temperature Distribution in Thighs Exposed to Ultrasound.**

ERNEST W. JOHNSON, M.D. (by invitation), Fellow, National Foundation for Infantile Paralysis, Inc., Division of Physical Medicine and Rehabilitation, Ohio State University, Columbus, and

JUSTUS F. LEHMANN, M.D., Division of Physical Medicine and Rehabilitation, University of Washington, School of Medicine, Seattle.

Thigh specimens were exposed to a uniform ultrasound field under well controlled conditions. The temperature distribution was measured along the axis of the sound beam and the heating pattern studied with special reference to the occurrence of the selective rise of temperature in certain tissues. The factors determining the temperature elevation in the specimen such as absorption and interface reflection of ultrasound, the specific heat and heat conductivity of tissues, were analyzed and their significance for the resulting temperature distribution discussed. Also the temperature gradient in the thigh as it occurs in man and its influence on the rise of temperature resulting from exposure to ultrasound was investigated.

**INTERMISSION — INSPECTION OF EXHIBITS**

10:15 **Is Elastic Bracing Contraindicated in Spastics?**

OTAKAR MACHEK, M.D. (by invitation), Physical Medicine and Rehabilitation Service, St. Mary's Group Hospitals, Saint Louis University, St. Louis, Mo.

A discussion about elastic bracing and its influence on spasticity prompted a suggestion that perhaps elastic bracing did not cause an increase in spasticity. This initiated a study of 84 patients who were fitted with both Klenzak and 90° stop braces. The length of follow-up of these patients varies from two and a half years to six months. In four instances a 90° stop brace was changed to a Klenzak type of brace without increase in spasticity. The subjective and objective evaluation suggests that there is no contraindication to elastic bracing in spastic conditions such as, cerebral palsy, spasticity, and old spastic hemiplegia. This is true of both children and adults. The explanation of this phenomenon is simply the adaptation.

10:30 **An Experimental Group Approach Supplementing Rehabilitation.**

IRVIN A. KRAFT, M.D. (by invitation), Assistant Director, Family Study Unit, Department of Psychiatry and Neurology, Tulane University, School of Medicine, New Orleans.

An experimental group therapy program was instituted with parents of adult cerebral palsy patients. It attempted to test certain hypotheses about alterations of personality in cerebral palsy patients, especially those with speech handicaps.

10:45 **Preliminary Report of Neuromuscular Function Testing of the Upper Extremity in Adult Hemiplegic Patients.**

GLENN G. REYNOLDS, M.D. (by invitation), Department of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center;

KENNETH C. ARCHIBALD, M.D. (by invitation), Department of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center;

SIGNE BRUNNSTROM, R.P.T. (by invitation), Department of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, and

NOLA THOMPSON, O.T.R. (by invitation), Department of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, New York City.

A measurement of return of motor function following hemiplegia is described. This test utilizes the basic synergies of motion of the upper extremity, observed in extensive upper motor neuron disease. The background for its use follows the development of progressive functional activities out of the synergies described. Its advantage over standard muscle testing procedures have been discussed. It would also be desirable to stimulate further exploration of better methods of evaluating these poorly understood responses in both the upper and lower extremities in all areas of upper motor neuron disease, so that therapeutic technics utilizing such responses may likewise be more effectively evaluated.

## SCIENTIFIC FILMS

THURSDAY, September 12 — 1 P.M.

Mission Room

**Rehabilitation of the Double Above-Knee Elderly Amputee**: *Black and white, silent, 25 minutes.*

Presented by Jerome S. Tobis, M.D.

**Discussion**

**Prevocational and Vocational Training for the Cerebral Palsied**: *Black and white, narrated, 26 minutes.*

Presented by Joseph E. Maschmeyer, M.D.

**Discussion**

**The Use of Resistive Exercises in Ambulation Training**: *Color, silent, 25 minutes.*

Presented by O. Leonard Huddleston, M.D.

**Discussion**

**Motion Patterns Used in Neuromuscular Re-Education**: *Color, silent, 20 minutes.*

Presented by O. Leonard Huddleston, M.D.

**Discussion**

## GENERAL SCIENTIFIC SESSION

**THURSDAY, September 12 — 2 P.M.**

**Sierra Room**

Presiding — LOUIS B. NEWMAN, Chicago
Assisting — JOHN H. ALDES, Los Angeles

2:00 **The Role of the Physician in Hiring the Physically Handicapped.**

JOHN H. ALDES, M.D., Director, Department of Rehabilitation, Cedars of Lebanon Hospital; Member, President's Committee for Employment of Physically Handicapped, Los Angeles.

The concept that employment is an important medicine in the total rehabilitation of the physically handicapped is covered. In this respect employment is not stressed as an economic factor but purely as a therapeutic measure. Partial employment of the patient in this pre-vocational phase furthers his progress towards full rehabilitation, this being full employment within his own physical capacity. Emphasis will be placed on the importance of treating the patient first as a human being with physical, mental, economic and emotional needs, and his handicap secondly, rather than the present tendency of the public to set apart the person with a conspicuous defect. The stigma of qualifying such persons as cripples serves to create a greater handicap. The presentation will also emphasize the importance of the physician serving as the backbone of the team, directing the various para-medical services of the rehabilitation center and working in close association with the employer to attain the end result, which is full employment. A history of the President's Committee for Employment of the Physically Handicapped, on national, state, civic and community levels will be outlined. This is a voluntary committee made up of representatives of insurance companies, labor unions, lawyers, doctors, educators, and public spirited citizens. The work is naturally educational, attempting to convince employers that "IT IS GOOD BUSINESS TO HIRE THE HANDICAPPED." Statistics illustrating the number of handicapped individuals in the United States will be given, stating what can be done in this program with the physician playing the leading role.

2:15 **Swimming by the Handicapped.**

NILA KIRKPATRICK COVALT, M.D., Winter Park Memorial Hospital, Winter Park, Fla.; Florida Sanitarium & Hospital, Orlando, Fla.

The majority of handicapped persons can learn to swim; many can be taught to get in and out of a pool with little or no aid. These attainments may surprise the individual but are most satisfying. Since swimming is one sport that utilizes all muscles, optimal physical conditioning can be obtained or maintained. This is a step beyond definitive underwater therapy — which it can also enhance, but which is no longer needed by a rehabilitated individual. It furnishes recreation, socialization and competition. Many handicapped persons can obtain Beginners and even Intermediate Swimmers Certificates from the American Red Cross. While swimming programs need not be under the auspices of the Red Cross, it is of interest to know that this organization has developed a training course for Red Cross instructors for the teaching of swimming for the handicapped.

2:30 **Mexican Efforts in the Field of Rehabilitation of its Disabled.**

JOSE ANTONIO IBARRA, M.D. (by invitation), Chief, Technical Department, Direccion General de Rehabilitation, and

DAVID AMATO (by invitation), Mexico City.

Mexico's organizational efforts covering the problem of the disabled person and the establishment of 14 rehabilitation centers in the past four years is discussed; private and governmental efforts are listed as well as the establishment of technical training programs for the preparation of a professional staff. This study will also discuss how other Spanish speaking countries are taking advantage of these training programs.

2:45 **Analysis of Residual Disabilities Among 100,000 Poliomyelitis Patients.**

KENNETH S. LANDAUER, M.D., Respiratory and Rehabilitation Center Services, National Foundation for Infantile Paralysis, and

GABRIEL STICKLE, M.A. (by invitation), New York City.

An analysis of residual disabilities among poliomyelitis patients has value for many reasons. An important one is to help determine the size and composition of the caseload of poliomyelitis patients who might benefit by further active rehabilitation procedures. The present analysis is based upon compilation and tabulation of data obtained from a series of patient-care reporting forms used by hospitals to notify chapters of the National Foundation for Infantile Paralysis of the admission, continued care and discharge of poliomyelitis patients. More than 1500 hospitals have submitted more than 1,000,000 forms since the inception of a reporting system in 1952. Detailed case histories are available for slightly more than 100,000 hospitalized poliomyelitis patients. The reporting forms call for information on the area and degree of paralysis, as well as functional capacity, as reported by the attending physician, for each patient. It was therefore possible to make cross-classifications on disabilities, graded as none, slight, moderate or severe, in eight body areas; namely, left and right arms, left and right legs, intercostal muscles, diaphragm, abdominal muscles and trunk extensors. On the basis of a scoring system which combines degrees of disability for these specific areas of the body, it is possible to estimate percentages and numbers of paralytic patients with no, slight, moderate and severe residual disability. When these estimates are compared with reported functional capacity — ability to stand, walk, feed, toilet self, etc. — they match closely.

3:00 **Desert Spa Therapy.**

ROBERT BINGHAM, M.D., Medical Director, Angel View Crippled Children's Foundation, and

FRANK S. ZACH, M.D. (by invitation), Angel View Crippled Children's Foundation, Desert Hot Springs, Calif.

Hot mineral springs are numerous throughout the United States but the western half of the United States has orthopedic surgeons or physiatrists available for consultation and supervision of patients. The authors report on their experiences at the Angel View Crippled Children's Foundation at Desert Hot Springs, Calif. The advantages of hot mineral baths result from increased blood circulation, reflex dilatation of the peripheral arterioles and capillaries and a rise in skin temperature which have the effect of reducing tightness of muscles and fascia, reducing stiffness of joints, improving circulation in cold and pulseless extremities, reducing calcium deposits in bursae and joints, helping to heal ulcers and indolent wounds, causing closure and healing of draining bone and joint infections and relieving pain in gout, varicose ulcers and all forms of chronic joint inflammation. In addition to the listed orthopedic conditions, many general disturbances of the circulatory and excretory systems are benefited by hot baths. Underwater exercises for painful joints and paralyzed muscles are facilitated by the hot mineral pools. The muscle spasm of the acute stage of poliomyelitis is relieved by such baths as well as by hot packs. Underwater treatment is designated as pre-ambulation therapy. The authors believe that some beneficial absorption of the minerals in these baths takes place through the skin and possibly as a result of the inhalation of chemical gases. The cooperation of orthopedists with specialists in physical medicine, internal medicine and pediatrics in the care of patients receiving treatment at mineral springs is emphasized.

3:15 **Scientific Basis for Neuromuscular Reeducation.**

HARVEY E. BILLIG, JR., Medical Director, The Billig Clinic, and

ANTOINETTE PERILLO, M.D. (by invitation), The Billig Clinic, Los Angeles.

An analysis is made of the basic neuronal pathways by which the function of muscles is controlled through sensory-motor nerve control in association with proprioceptive control. The importance of the gradual development of the sequence of reciprocally interwoven patterns is discussed. The physiologic locale of limiting factors, e.g., power, endurance, fatigue as to whether it be neuronal, neuromuscular, muscular, or psychic is analyzed. Teaching methods used in neuromuscular reeducation are outlined to include enzymatic chemical anabolites, electromyographic auditory and visual aid, psychic-hypnotic suggestion perceptive aid. Examples of use of the listed modalities with illustrative description of the rapidity by which neuronal pathway readjustment of the nervous system can be obtained through hypnotic suggestion (immediate proper adjustment to learn to use a transplanted muscle tendon so as to function properly in its new location).

## GENERAL SCIENTIFIC SESSION

**FRIDAY, September 13 — 9:30 A.M.**

**Los Angeles Room**

Presiding — DONALD J. ERICKSON, Rochester, Minn.
Assisting — FRED B. MOOR, Los Angeles

9:30 **Present Status of Artificial Unipolar Ionization of the Air.**

IGHO HART KORNBLUEH, M.D., Associate in Physical Medicine, The Graduate School of Medicine, University of Pennsylvania; Medical Director, Department of Physical Medicine and Rehabilitation, The Graduate Hospital of the University of Pennsylvania; Chief, Department of Physical Medicine and Rehabilitation, Northeastern Hospital of Philadelphia, and

FORREST P. SPEICHER, M.A. (by invitation), Research Associate in Biology, Northeastern Hospital of Philadelphia, Philadelphia.

The influence of weather and climate on the health and performance of man is well established. A number of psychophysiological and pathological conditions can be attributed to the direct impact of atmospheric agents. A better understanding of these effects was gained by the reproduction of various climatic phases under laboratory conditions. Evaluation of the physiological influence of the natural ionization of the air was in the past greatly hampered by the lack of dependable instruments. Continuous variations in the concentration of air ions of both polarities added substantially to the difficulties encountered. More recently, the development of adequate metering devices permitted a satisfactory approach to the complex of natural and artificial ionization. Controlled ion generation without concomitant increase of ozone and other harmful gaseous substances made this method safe and reliable. From the great number of experiments performed by a number of investigators few showed significant results and are discussed in detail.

9:45 **Uses of Miniature Furniture in Aphasia Retraining.**

JOSHUA EHRLICH, M.D., Chief, Physical Medicine and Rehabilitation Service, VA Hospital; Assistant Clinical Professor of Physical Medicine, Albany Medical College, and

JEANNE C. COOK, M.A. (by invitation), Language Retraining Therapist, Educational Therapy Section, Physical Medicine and Rehabilitation Service, VA Hospital, Albany, N. Y.

This study includes an introduction incorporating a brief history of the study and treatment of aphasia. Methods for evaluating the aphasic patient and planning individualized therapy, taking into consideration the educational and vocational background, as well as the type and extent of the aphasia are described. Description, purpose and use of a specific type of equipment — separate, miniature "rooms" and household objects, tools and other kinds of furnishings to scale — are given. Three case studies illustrate the uses of this device. A short summary restates the effectiveness of this particular type of equipment in the light of what is known of language development and aphasia retraining.

10:00 **Influence of Arteriovenous Fistula on the Distal Circulation in the Involved Extremity.**

KHALIL G. WAKIM, M.D. (by invitation), Section of Physiology, Mayo Clinic, and

JOSEPH M. JANES, M.D. (by invitation), Section of Orthopedic Surgery, Mayo Clinic, Rochester, Minn.

By use of the venous occlusion plethysmograph with a compensating spirometer recorder, the blood flow in the lower extremities below the knee was measured before and after induction and repair of the arteriovenous fistula of the involved extremity. After the establishment of the preoperative blood flow values, a femoral arteriovenous fistula was surgically induced in the stunted limb. At various periods after operation up to about one year, the blood flow was measured in both the normal and the operated extremity and was compared with the preoperative value. After induction of the arteriovenous fistula, the blood flow in the involved extremity in each of the seven subjects was reduced, in two of them slightly, but in the remaining five significantly. In four patients with congenital or accidental arteriovenous fistula in one of the lower extremities, a similar study was made on the blood flow before and after surgical repair of the fistula. The distal blood flow in each of the involved extremities increased on repair of the arteriovenous fistula. The presence of an arteriovenous fistula in the lower extremity reduces the flow of blood to the distal parts of that extremity.

10:15 **Comparative Study of the Effects of Tenotomy and of Denervation.**

CHARLES H. FLINT, M.D. (by invitation), Fellow in Physical Medicine and Rehabilitation, Mayo Foundation;

KHALIL G. WAKIM, M.D. (by invitation), Section of Physiology, Mayo Clinic, and

FRANK H. KRUSEN, M.D., Professor of Physical Medicine and Rehabilitation, Mayo Foundation, University of Minnesota; Head, Section of Physical Medicine and Rehabilitation, Mayo Clinic, Rochester, Minn.

In a large group of adult albino rats a comparative study at intervals up to 120 days was made of the work output, endurance, weight, and histologic structure of the muscles of the tendo achillis and the tibialis anterior in the lower extremities after tenotomy of the tendo achillis, excision of the tibial nerve alone, or complete denervation by high excision of the sciatic and femoral nerves. Excision of the tendo achillis led to gradual reduction of work output and endurance of the gastrocnemius-soleus-plantaris muscle group up to 30 days, after which there was a progressive return toward normal function. Careful dissection of the muscles at the time of return to normal function revealed complete reattachment of the excised tendon to bony eminences in the area. Tibial denervation gave unsatisfactory results. The findings were inconsistent. Either reduction or no change from normal activity of the muscles was obtained. Thorough dissection of the muscles revealed that excision of the tibial nerve does not always completely denervate the muscles of the tendo achillis. Complete denervation by excision of both sciatic and femoral nerves high up in the thigh was associated with consistent progressive deterioration of function, resulting in marked reduction of work output and endurance of the muscles and a histologic picture of complete denervation with marked decrease of muscle weight. The work output was practically nil toward the end of the observation period (120 days) in the muscles whose nerve supply was abolished by high excision of the sciatic and femoral nerves.

10:30 **Implications of Measured Visuo-Spatial Impairment in a Group of Left Hemiplegic Patients.**

VIRGINIA B. CARROLL (by invitation), Head, Speech Department, Elizabeth Kenny Institute, and MILAND E. KNAPP, M.D., Medical Director, Elizabeth Kenny Institute, Minneapolis.

An analysis of errors on the Minnesota Test for Differential Diagnosis of Aphasia with left hemiplegic patients is presented in contrast with known test patterns of right hemiplegic patients with aphasia. The specific findings with the non-dominant hemisphere group reveal a significant homogenous deficit in visuo-spatial, temporal and numerical relationships as well as a similarity in behavior responses to the observed impairment. The therapy attempted is discussed and the patient response is related to known concepts of learning theory. The implications of the residual deficits are then related to the individual vocational needs of the patient.

## SUPPLEMENT

Papers here listed will be read by title. All papers in this group will be submitted for publication in the ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION.

**Use of Sand as an Ambulation Medium in Gait Retraining and Correction of Faulty Foot Posture.**

FOLKE BECKER, M.D., and WILLIS P. DENNY, B.S. (by invitation), Dublin, Ga.

**Experiences with Sister Kenny.** HOWARD A. CARTER, M.E., Chicago.

**Contribution of Physical Medicine and Rehabilitation to the Geriatric Patient.** CHARLES A. FUREY, JR., M.D., Philadelphia.

**Rehabilitated for Living.** MORTON HOBERMAN, M.D., and BENJAMIN LIPTON, M.A. (by invitation), New York City.

**A Rehabilitation Center as a Private Enterprise.** DUANE A. SCHRAM, M.D., Seattle.

## SCIENTIFIC EXHIBITS

**Audiology in the Veterans Administration.** BERNARD M. ANDERMAN, Ed.D.; NORTON CANFIELD, M.D.; G. DONALD CAUSEY, Ph.D.; RAYMOND T. CARHART, Ph.D., and A.B.C. KNUDSON, M.D.

**Normal Muscular Forces in Childhood.** WILLIS C. BEASLEY, Ph.D.

**Rehabilitation in a Large Medically Directed Voluntary Nursing Home.** H. J. BEHREND, M.D., and B. BRODOFF.

**Parkinson's Disease Importance of Therapeutic Exercises in Its Management.** E. C. CLARK, M.D.; D. W. MULDER, M.D.; D. J. ERICKSON, M.D.; B. G. CLEMENTS, M.D., and C. S. MAC CARTY, M. D.

**Electrovasography: Quantitative Diagnosis in Vascular Disorders.** LEWIS COHEN, M.D.

**Total Management of Muscle Dysfunction.** HARRIET E. GILLETTE, M.D.

**The Use of Adaptive Equipment to Achieve Vocational Goals.** MILAND E. KNAPP, M.D.; PAUL M. ELLWOOD, JR.; DOUGLAS FENDERSON, and GEORGE JEYS.

**Rehabilitation for Living.** MORTON HOBERMAN, M.D.

**Utilization of Physical Medicine at a Rehabilitation Center.** O. LEONARD HUDDLESTON, M.D.; RICHARD W. MOORE, M.D., and DAVID RUBIN, M.D.

**Rheumatoid Arthritis.** WILLIAM J. LA JOIE, M.D.

**Cerebral Palsy Industrial Production Training Workshop.** JOSEPH E. MASCHMEYER, M.D.; MARGARET H. JONES, M.D.; ALDO BAIRO, and PAT HOLSER.

**A Visual Technic for Instruction of the Patient in Home Exercise.** WILLIAM D. PAUL, M.D., and TERRY B. JONES, R.P.T.

**American Academy for Cerebral Palsy — Brain Registry Exhibit. "Infantile Spastic Hemiplegia Clinical Pathological Correlations."** MEYER A. PERLSTEIN, M.D.; MARGARET H. JONES, M.D.; HERMAN JOSEPHY, M.D., and WEBB HAYMAKER, M.D.

**National Foundation for Infantile Paralysis. "Concept of Total Rehabilitation."** THOMAS M. RIVERS, M.D.

**Hypercortisonism in Patients with Rheumatoid Arthritis.** CHARLES H. SLOCUMB, M.D.; HOWARD F. POLLEY, M.D.; EMMERSON WARD, M.D., and JOHN G. MAYNE, M.D.

**American Board for Certification of the Prosthetic and Orthopedic Appliance Industry, Inc. "Educational Developments in the Limb and Brace Field: Implications to the Physiatrist."** LESTER A. SMITH; KENNETH DODD, and LEROY NOBLE.

**Management of the Brain Damaged Patient — Evaluation and Rehabilitation.** JEROME S. TOBIS, M.D.; MILTON LOWENTHAL, M.D., and SIMON MARINGER, M.D.

**The Paralytic Dislocation of the Hip: A Problem in the Rehabilitation of Children with Poliomyelitic Sequelae.** ALPHONSO TOHEN ZAMUDIO, M.D.; LUIS SIERRA ROJAS, M.D., and LUIS GUILLERMO IBARRA, M.D.

## TECHNICAL EXHIBITS

**V. RAY BENNETT AND ASSOCIATES, INC. — Booth 5**

The Bennett Pressure Breathing Therapy Unit, including the widely-used Models TV-2P and PV-3P, will be shown, together with the new Cycling Attachment. This new attachment converts the Bennett Unit optionally to automatic cycling. Also shown will be the GBL Infant Hand Resuscitator, designed for emergency problems of the new-born.

**THE BIRTCHER CORP. — Booths 1 and 2**

Occupying booths 1 and 2 with an exhibit of various equipment of Physical Medicine, The Birtcher Corporation will augment its convention activities by welcoming a visit to the factory in Los Angeles and providing transportation for those physicians who may desire to accept the invitation at any time during the week.

**THE BURDICK CORP. — Booth 46**

The Burdick Corporation will exhibit in booth 46 their modern line of Physical Medicine Equipment. Features of special interest will be their Ultrasonic Therapy units as well as Microwave Diathermy.

**S. H. CAMP AND CO. — Booth 48**

There are interesting new products and new developments in the Camp line of Surgical Supports and Appliances. All are designed to achieve better function in meeting the need when indicated in your practice. Your patients will appreciate the comfort, quality and low cost to them. It will behoove you to see and acquaint yourself with the items on display at their booth 48.

**CHATTANOOGA PHARMACAL CO., INC. — Booth 44**

**THE COCA-COLA CO. — Booths 16 and 17**

Ice-cold Coca-Cola will be served through the courtesy and cooperation of the Coca-Cola Bottling Company of Los Angeles, Los Angeles, California and the Coca-Cola Company.

**DAKON TOOL & MACHINE CO., INC. — Booth 25**

DAKON TOOL & MACHINE CO., INC. manufacturers for over twenty years of a complete line of hydrotherapy equipment comprising twenty-four portable and stationary, single and dual motored models, precision engineered ultrasonic machines for medical usage, and audiometers will be at your service. Distributed by all reliable dealers throughout the U.S.A.

**DALLONS LABORATORIES, INC. — Booth 50**

This year DALLONS LABORATORIES, INC. will display our latest group of Electro-Medical instruments. Besides our two Medi-Sonar Ultrasonic generators, we will demonstrate a meter to measure accurately the acoustic output of ultrasonic transducers. Our Ultraviolet generators and Medi-Therm Diathermy will be displayed with two completely new Medi-Sine Muscle Stimulators.

**EVEREST & JENNINGS, INC. — Booths 11 and 12**

Be sure to see the amazing new Everest & Jennings Power Drive Wheel Chair. Single push button control — a flick of the finger and you're on your way — any direction you want to go, safely, effortlessly, **independently.**

**R. A. FISCHER & CO. — Booth 34**

You are most cordially invited to visit the R. A. Fischer and Company booth. The latest ultrasound units plus several new models in low volt field will be featured. All members and their guests are invited to demonstrations and instruction on the use of these units. R. A. Fischer ultrasound units feature surge and impulse modalities in addition to continuous sound output.

**HERBST SHOE MANUFACTURING CO. — Booth 18**

The Herbst Shoe Manufacturing Company will exhibit a display of various types of shoe wedges which are most commonly used in the correction of children's foot abnormalities. CHILD LIFE Shoes are made in two constructions, Regular and Arch Feature. The display will show the comparative construction of these shoes, the quality features found only in CHILD LIFE and will display the wedges which are most adaptable to these shoes. Don't miss our booklet on Children's Foot Health.

**ILLE ELECTRIC CORP. — Booth 43**

HYDROMASSAGE SUBAQUA THERAPY EQUIPMENT. Ille Electric Corporation will demonstrate in exhibit booth 45 how the care of infantile paralysis, arthritis, and other disabling conditions can be greatly improved by the use of Hydromassage Subaqua Therapy Tanks. They will display a Mobile Whirlpool Bath with Mobile Adjustable High Chair and Paraffin Bath.

**MICHAEL KEROPIAN ORTHOPEDIC APPLIANCES — Booth 39**

Introduces a new Functional Head Brace which was designed to meet the ever increasing need for a brace which would be completely adjustable, allow function, prevent or correct deformity. A basic hand brace with a number of outriggers and attachments is demonstrated.

**LA BERNE MFG. CO., INC. — Booth 33**

LaBerne Manufacturing Company will show at this meeting The Resistive and Assistive Exercise Unit. This unit offers exercises including abdominal and erector spinali, hip and knee flex, intercostal and diaphragm, quadriceps femoris, making possible many exercises previously difficult if not impossible.

**THE LIEBEL-FLARSHEIM CO. — Booth 27**

The Liebel-Flarsheim Company cordially invites you to visit booth 27 in which their latest electromedical equipment will be exhibited. Capable representatives will be on hand to show you the many advantages of L-F Diathermy Units, including long-path, deep heat treatments with L-F Air-Spaced Plates. The new L-F BasalMeteR, Self-Calculating BMR Apparatus, will also be on display.

**R. J. LINDQUIST CO. — Booth 49**

Stationary ultrasound treatments with multiple-crystal soundheads applied in fixed position produce better therapeutic results. Constant personal attention of the therapist or doctor is not required. See this new Lindquist development at booth 49. Other instruments to be displayed are the Chronowave stimulator, Desert Sun lamps, Short Wave diathermy, and the Chronaximeter.

**LOGAN, INC. — Booth 30**

Portable whirlpool bath, one of several to be featured, is powered by Westinghouse motor to circulate water at rate of 3000 gallons per hour. Made of heavy 20 gauge stainless steel, with large 2½" dial thermometer. Turbine ejector doubles for emptying purposes. Featured model measures 48" long x 21" wide x 25" deep. Built for accessibility and effective underwater exercise hydromassage. Other stationary and portable models offer special features. Accessories such as adjustable sling seats, snap-on seats, and immersion heaters are available. Approved by Los Angeles official Electrical Testing Laboratories. We will also feature our new knee and ankle strengtheners.

**MEDCO PRODUCTS CO. — Booth 38**

Presenting the MEDCO-SONLATOR. Providing a new concept in therapy by combining muscle stimulation and ultrasound simultaneously through a single Three-way Sound Applicator.

The MEDCO-SONLATOR is a distinct advance in the effectiveness of physical therapy in your office or hospital. A few minutes spent in our booth should prove of value to your practice.

**MEDCRAFT ELECTRONIC CORP. — Booth 10**

MEDCRAFT ELECTRONIC CORP. will exhibit its Model M2 recording Electromyograph and its new portable Electromyograph. Technical personnel will be on hand to demonstrate the instruments and answer any questions concerning these units or the company's many other therapeutic, diagnostic, and laboratory instrument field.

**THE MEDITRON CO. — Booth 26**

ELECTROMYOGRAPHS by MEDITRON, the original and leading company in this field. One and two channel ELECTROMYOGRAPHS and the MEDITRON Stimulus Control Unit with which Nerve Conduction Time Studies can readily be made on MEDITRON ELECTROMYOGRAPHS will be demonstrated. See the Square Wave CONSTANT CURRENT IMPULSE STIMULATORS AND CHRONAXIMETERS.

**PORTO-LIFT MFG. CO. — Booth 41**

The original producer of invalid lifting equipment, PORTO-LIFT MANUFACTURING CO. pioneered the development of bed patient transfer facilities. The sturdily constructed PORTO-LIFT is completely mobile, utilizing easy-to-operate hydraulic action that eliminates physical strain on attendant . . . ensures smooth and comfortable patient transfer from bed to wheel chair, conventional chair, automobile and bath. With the additional accessories available every lifting and transfer problem can be met with ease.

**J. A. PRESTON CORP. — Booths 42 and 43**

Showing selected items of interest to the physiatrist from our COMPLETE LINE OF EQUIPMENT FOR PHYSICAL MEDICINE AND REHABILITATION. The exhibit will include latest advances in DIAGNOSTIC APPARATUS, Exercise Equipment, CEREBRAL PALSY EQUIPMENT, Special Aids for GERIATRICS, and Self-Help Devices for Activities of Daily Living. A selection of books will also be shown. You are invited to use our Layout and Planning Service for new departments and offices — our representatives will gladly furnish information to you.

**RAYTHEON MFG. CO. — Booth 47**

Raytheon's exhibit highlights the **deep therapy twins . . .** the well known Microtherm microwave diathermy unit, and the new Raytheon Ultrasonic Therapy Unit. Also featured are the new Raytheon Electrocardiograph (the ECG with the Replaceable Heart) and the Micronaire portable electronic air cleaner, which is 99.2 per cent efficient in eliminating pollen, dust, smoke and other airborne impurities.

**REHABILITATION PRODUCTS — Booths 3 and 4**
**(Division of American Hospital Supply Corp.)**

An exhibit of representative products from a complete line of rehabilitation and physical medicine equipment. Ambulation aids, diagnostic instruments, exercise equipment, therapeutic furniture, self-help devices, and many other items are featured.

**TECA CORP. — Booth 37**

**THERMO-ELECTRIC CO. — Booth 29**

Thermo-Electric Company will display the Dickson Paraffin Baths which were pioneered and developed in co-operation with Cleveland Hospitals where they have been in continuous use for the past 17 years. Noteworthy features are the mahogany mouldings designed for the comfort of the patient; double control of the melting element insuring maximum safety; and improved patented drain. Several models will be shown.

**TRU-EZE MFG. CO., INC. — Booth 28**

Demonstrating the new TRACTOMATIC, portable intermittent traction machine. EFFECTIVE, VERSATILE and EXTREMELY ECONOMICAL. Adaptable to horizontal cervical or pelvic traction or vertical cervical traction. Simple to operate and easy adjustable features.

Also exhibiting various economical traction sets for home use, supplementing office treatment and aiding in earlier hospital release.

**WYETH LABORATORIES, INC. — Booth 40**

EQUANIL® (Meprobamate*, Wyeth) unique anti-anxiety factor with marked muscle-relaxing properties. EQUANIL reduces skeletal muscular tension as well as psychic tension, allowing contracted muscles to respond more readily to stretching and manipulation. It is of value in the treatment of cervical myositis, acute and chronic low back strain, and various osteo-arthritic conditions.

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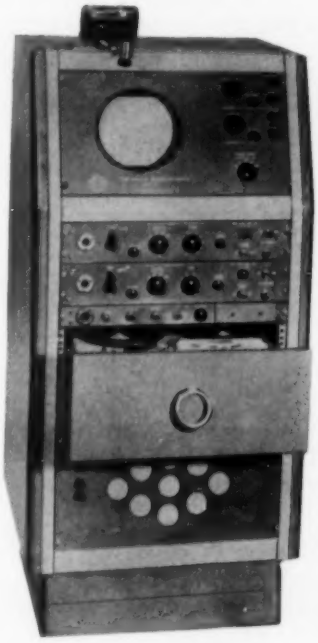

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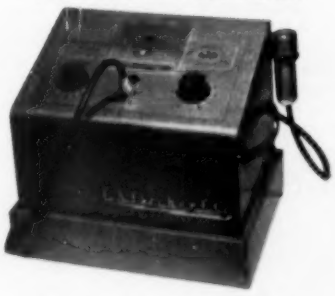

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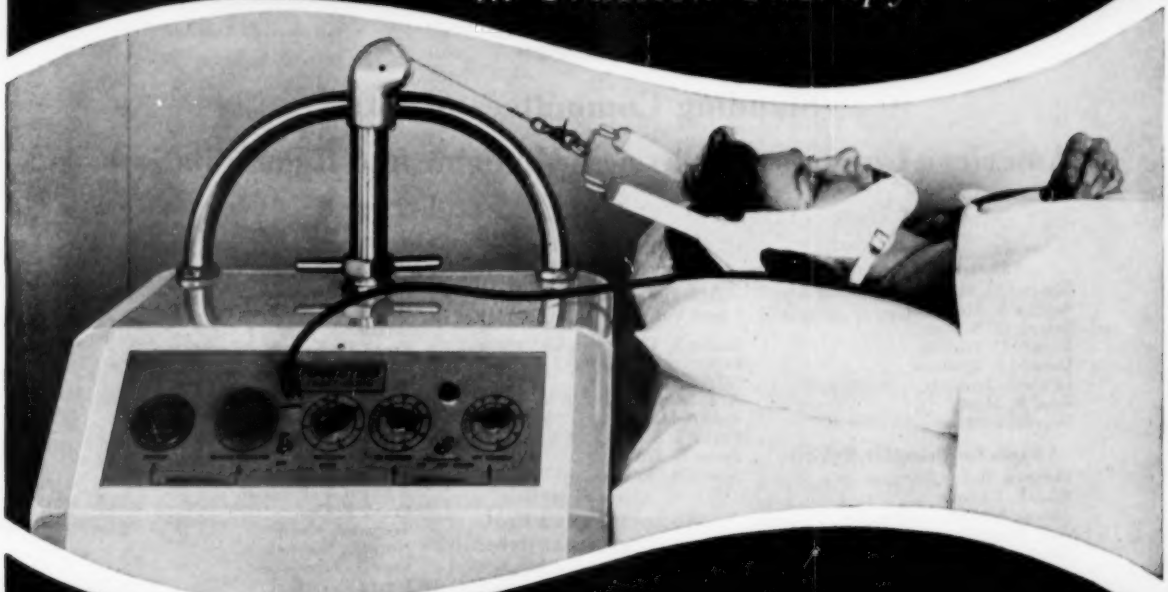

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*Laughter can't be injected, swallowed or rubbed-in, but a good chuckle, taken regularly, is great therapy for what ails most of us. I ran across an editorial in the Los Angeles Times, April 30th issue, by columnist Jack Geyer, which I want to pass along in its entirety:*

## IN LOW GEYER

*by* JACK GEYER

Prior to an operation the doctor normally sends the patient through a rather thorough third degree.

This is understandable. In order to do a proper job the physician needs all the inside information he can get.

During this interrogation the patient is usually placed where the light shines in his eyes.

The doctor seats himself across the way, takes a form from his files and begins asking questions.

How old are you? How much do you weigh? How tall are you? Married? Children? How many? What sexes? Do you drink? How often and how much? Do you smoke? How much? Any previous operations? When? How is your general health? Do you have any brothers or sisters? How is their health? Parents living? How is their health? Are you allergic to any drugs? Do you have medical insurance?

By the time the doctor finshes, the patient doesn't know if he's been talking to an M.D. or a D.A.

It is my considered opinion that this interview should not be a one-way street. Why should the man in the white coat ask all the questions? If he's going to wield a medical machete on you, then you are entitled to some answers. Two can play at this game.

With this in mind, I've drawn up a series of questions designed to put the patient's mind at ease prior to a clinical coming-out party. As follows:

Doctor, how old are you? Do you drink? How often and how much? Do you smoke? How much? Filter-tips? How about coffee, Doctor, how many cups a day? How are your nerves, Doctor? You aren't, I trust, the type who jumps at unexpected noises? Do you get much exercise? How long have you been doing this type of operation? Where did you go to medical school? Did you really want to be a doctor, or were you following the wish of your parents? What kind of grades did you get in school? Especially in surgery? How long have you been wearing those thick glasses, Doc? Are they bifocals? And how long since you've had an eye examination? Would it trouble you to furnish a list of five former patients who've undergone this particular operation? What was the name of your surgical professor in medical school? I'd like to give him a call.

Now, Doctor, nothing personal, of course, but about that diploma on the wall. I'm not saying it isn't yours, of course, but there are places where anybody can buy any kind of a diploma. Purely as a precautionary measure, would you mind giving me your fingerprints so I can check with the FBI to make certain you're really who you say you are?

Are you married? Happily, I mean. Are you the type who carries grudges? How about the fellow giving the anesthetic, Doc? Is he a good, steady citizen? The trustworthy type? How's the food at this hospital, Doc? And how's the television reception? Can you get all the channels from here? Does my room have a good view? Any cute nurses?

Something else is bothering me, Doc. I know that everyone wears masks in the operating room. Now how can I be sure it's you in there and not some ringer? Do you guys wear numbers or something?

I notice that I'm going to have a local anesthetic. If the imported one is better, let's have that. At a time like this, money is no object.

When was the last time you bought a new set of tools? You know how it is, Doc, look sharp, be sharp, feel sharp.

And one last thing, Doc. Is this trip really necessary?

•

When I wrote Jack Geyer to ask his permission to reprint this there was a three week delay in his reply. Seems he went to the hospital for an operation a day or two after writing the above. He declined to state the nature of his surgery, making only the comment that he has been doing most of his work standing.

•

Make your plans now to attend the 5th Annual Meeting of the American Institute of Ultrasonics in Medicine, Hotel Statler, Los Angeles, September 6th and 7th. From what I hear the program will be a lulu.

*Cordially,*

*Cecil Bitcher*

C. J. BIRTCHER, *President*
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